

CIRCULAR FLANGES FOR PIPES, VALVES AND FITTINGS

STEEL FLANGES CLASS 150 TO 2500

BS 1560: Section 3.1:1989

Dimensions, materials, facings, bolting and pressure-temperature ratings

STEEL FLANGES

CLASS 150 TO 2500

FLANGE FACINGS

RING-JOINT DIMENSIONS

BOLTING

PRESSURE-TEMPERATURE RATINGS

BS 1560: Section 3.1:1989

Technical data navigation

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REFERENCE NOTE		
Source dimensional values and footnotes are retained. Confirm the applicable material, grade, schedule and project specification before ordering.		

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REFERENCE NOTE		
Source dimensional values and footnotes are retained. Confirm the applicable material, grade, schedule and project specification before ordering.		

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REFERENCE NOTE

Source dimensional values and footnotes are retained. Confirm the applicable material, grade, schedule and project specification before ordering.

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Foreword

This Section of BS 1560 has been prepared under the direction of the Piping Systems Components Standards Policy Committee and constitutes the first revision of BS 1560 : Part 2 : 1970. BS 1560 : Part 2 will be withdrawn 12 months after the publication of this Section of BS 1560. For PN designated steel flanges, reference should be made to BS 4504 : Section 3.1.

It was originally intended that BS 1560 : Part 2 : 1970 would be superseded by a British Standard technically equivalent (or identical) to an international standard for a single series of flanges when finalized by ISO*/TC 5/SC 10, Metallic flanges and their joints. However, the International standard has not been finalized but this revision of BS 1560 : Part 2 : 1970 incorporates the principles of the international work.

To align with the format of ISO 7005, BS 1560 : Part 3 will be published in three Sections.

Section 3.1 Specification for steel flanges

Section 3.2† Specification for cast iron flanges

Section 3.3 Specification for copper alloy and composite flanges

BS 1560 : Part 2 : 1970 was based on American standard ANSI B16.5 published by the American National Standards Institute, and, until such time as ISO 7005 : Part 1†, Steel flanges is published, and BS 1560 is further revised, this Part of BS 1560 continues to specify steel flanges that are interchangeable with flanges made to ANSI B16.5.

In ANSI B16.5 some dimensions are rounded decimal inches; however, in Section of BS 1560, all metric dimensions have been calculated from the original ANSI B16.5 fractional inch sizes.

The flanges specified in this Section of BS 1560 are intended to be interchangeable with, but not necessarily identical in every detail to, steel flanges manufactured to BS 1560 : Part 2 : 1970.

This Section of BS 1560 differs from BS 1560 : Part 2 : 1970 for the content covering the steel flange requirements in the following respects.

- (a) In this Section of BS 1560 the descriptions of the various types of flanges have been augmented with code numbers. The code numbers adopted are based on the type numbers specified in ISO 7005 : Part 1.
- (b) Plate flanges for welding, for Class 150 designations only, are included for the first time.
- (c) The 3½ in nominal size has been omitted.
- (d) Class 400 flanges have been omitted.
- (e) The pressure/temperature ratings are based on ANSI B16.5 and it should be noted that there are some differences to the ratings given in BS 1560 : Part 2 : 1970.

(f) Materials specified have been revised, new materials added and reference is made to comparable ASTM ‡ materials. Generally, the range of materials corresponds to those given in ISO 7005 : Part 1.

(g) All flange dimensions are within approximately 0.5 mm of the proposed international standard and ANSI B16.5 metric dimensions so the flange dimensions of BS 1560 : Part 2 : 1970 generally have been retained. Inch dimensions have been retained for bolt holes to accommodate inch dimensioned bolts.

(h) Due to minor differences in the dimensions of ring joint facings between BS 1560 : Part 2 : 1970, ANSI B16.5 and ISO 7005 : Part 1, the ring joint dimensions in this Section of BS 1560 have been re-calculated from the ANSI fractional inch sizes.

(i) Tolerances have been compiled from requirements given in BS 1560 : Part 2 : 1970 and ISO 7005 : Part 1.

(j) Requirements for the surface finish of flange faces have been given in greater detail.

(k) The small spigot and recess flange facings (previously designated as small male and small female) and small tongue and groove facings have been omitted from this Section of BS 1560 since no requirements exist nationally. Therefore throughout this Section of BS 1560 reference is made to spigot/recess facings which correspond to the previously designated large male and large female and to tongue and groove facings which correspond to the previously designated large tongue and groove.

(l) Spot facing or back facing complies with ISO 7005 : Part 1.

(m) The marking of flanges is basically in accordance with the principles of ISO 7005 : Part 1 but limitations on the methods are included.

(n) For threaded flanges, BS 21 thread form is specified in addition to ANSI/ASME B1.20.1 and API 5B.

(o) Appendix A lists information that should be supplied by the purchaser when ordering flanges.

(p) Guidance notes and recommendations contained in BS 1560 : Part 2 : 1970 and similar notes in ISO 7005 : Part 1 have been included in appendix B. Appendix B is not intended to be exhaustive.

(q) Since BS 1560 : Part 2 : 1970 was published the lengths of stud bolts and headed bolts have been increased by ¼ inch in ANSI B16.5 in many cases. These revised lengths have been incorporated in this Section of BS 1560 (see appendix D). Furthermore, since bolt sizes are expressed in inches in this Section of BS 1560, it has been agreed that it is more logical to express the lengths of bolts in inches also.

(r) For information, pipe dimensions for flanges are given in appendix F. The nominal size of a flange is the same as the corresponding nominal pipe size.

*International Organization for Standardization.

†In preparation.

‡American Society for Testing and Materials.

(s) Details of minimum hub radius after back facing are included.

(t) This Section of BS 1560 specifies inch bolting only and the use of metric bolting is outside the scope of this Section of BS 1560. Appendix G gives the proposed metric bolt sizes to be used in lieu of the inch sizes specified, together with appropriate warnings.

(u) The specification of gasket types, materials and dimensions previously contained in BS 1560 : Part 2 : 1970 have been omitted from this Section of BS 1560.

Dimensions of gaskets for use with steel flanges to BS 1560 : Section 3.1 are specified in the following British Standards.

BS 3381	Specification for spiral-wound gaskets for use with steel flanges to BS 1560
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BS 7076

Dimensions of gaskets for flanges to BS 1560

Part 1 Specification for non-metallic flat gaskets

Part 2 Specification for metallic ring-joint gaskets

Part 3 Specification for non-metallic envelope gaskets

Part 4 Specification for corrugated, flat or grooved metallic and filled metallic gaskets

For comparison purposes, the descriptions of flanges used in this Section of BS 1560 are compared with the descriptions given in appendix H of BS 1560 : Part 2 : 1970.

Assessed capability. Users of this Section of BS 1560 are advised to consider the desirability of assessment and registration of a supplier's quality systems against the appropriate Part of BS 5750 by a third party certification body.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Specification

1 Scope

This Section of BS 1560 specifies requirements for Class designated circular steel flanges of Class 150 to Class 2500 and in nominal sizes up to 24 in of the type given in table 1.

Table 1. Types of steel flange	
Code no.*	Description
101	Plate flange for welding
105	Blank flange
111	Weld-neck flange
112	Hubbed slip-on flange for welding
113	Hubbed threaded flange
114	Hubbed socket-weld flange
115	Loose hubbed flange for lapped pipe end†
121	Integral flange
*Code numbers have been made non-consecutive to permit possible future additions.	
†Sometimes referred to in industry as lapped flange.	
NOTE. Flanges and facings may be designated by code number and facing letter or by description as given in figures 1 and 2 respectively.	

This Section of BS 1560 specifies types of steel flanges and their facings, dimensions, tolerances, threading, bolt sizes, flange face surface finish, marking, materials for bolting and flange materials together with associated pressure/temperature ratings.

The weld end preparation of weld-neck (code 111) flanges (see 7.4) and the routine inspection and testing of flanges are outside the scope of this Section of BS 1560 but some guidance on maximum test pressure is given in appendix B.

NOTE 1. To assist purchasers appendix A lists information which should be supplied when ordering flanges.

NOTE 2. The titles of publications referred to in this standard are listed on the inside back cover.

2 Ranges of nominal sizes

The ranges of nominal sizes from 1/2 to 24 applicable to each flange type and for each Class designation shall be as given in table 2.

3 Class designations and pressure/temperature ratings

3.1 Class designations

The range of Class designations shall be as follows:

- Class 150;
- Class 300;
- Class 600;
- Class 900;
- Class 1500;
- Class 2500.

3.2 Pressure/temperature ratings

The pressure/temperature ratings of the flanges manufactured from the materials specified in table 3 shall be as given in tables 16 to 21 for applicable materials and shall be the maximum allowable non-shock working gauge pressure at the temperature shown.

NOTE 1. Linear interpolation is permitted for intermediate temperatures. The relevant pressures and temperatures are those of the fluid in the pipework system.

NOTE 2. The rating of flanges is not necessarily the rating of the whole pipework system. Gasket materials can also impose limitations on the pressure/temperature rating of a flanged joint and the gasket manufacturer should be consulted when selecting the material of the gasket.

3.3 Rating of flanged joints

If two flanges in a flanged joint do not have the same pressure/temperature rating, the maximum permissible working pressure of the joint at any temperature shall not exceed the lower of the two pressure ratings.

4 Materials

4.1 Flange materials

Flanges shall be manufactured from materials selected from table 3 except that codes 111, 112, 113, 114 and 115 flanges shall be manufactured from a forging or casting.

NOTE 1. The materials specified in table 3 are tabulated in groups having common pressure/temperature ratings as given in tables 16 to 21.

NOTE 2. The purchaser should state in the enquiry and/or order if a certificate is required for the flange material (see appendix A).

4.2 Requirements governing the use of ASTM materials

- 4.2.1 *General.* Flanges manufactured from materials conforming to ASTM specifications shall comply with the following additional requirements.
- (a) For material to ASTM A105;
 - (1) when specified all forgings shall be normalized;
 - (2) subclauses 4.2.2.1, 4.2.2.2 and 4.2.2.3 shall apply.
 - (b) For material to ASTM A182;
 - (1) the carbon content, by ladle analysis, of grades F304L and F316L shall not exceed 0.030 %;
 - (2) subclause 4.2.2.3 shall apply.

- (c) For material to ASTM A350;
subclauses 4.2.2.1 and 4.2.2.2 shall apply only to carbon manganese steels (grades LF1 and LF2). Subclause 4.2.2.3 shall apply to carbon manganese and low-alloy steels (grade LF1, LF2 and LF3).
- (d) For material to ASTM A387;
(1) when specified, all flanges and flanged fittings shall be supplied in the normalized and tempered condition;
(2) subclause 4.2.2.3 shall apply.

NOTE. The purchaser should state any specific requirements for the heat treatment condition on the enquiry and/or order (see appendix A).

4.2.2 Carbon manganese and low alloy steels

4.2.2.1 The carbon content by ladle analysis of the materials specified in 4.2.1 shall not exceed 0.23 % for plate and 0.25 % for forgings.

4.2.2.2 The carbon equivalent (CE_1) by ladle analysis of the materials specified in 4.2.1 shall not exceed 0.42 where:

$$CE_1 = C + \frac{Mn}{6}$$

The manufacturer shall ensure on a basis of regular production checks that the carbon equivalent (CE_2) by ladle analysis does not exceed 0.45 where:

$$CE_2 = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

4.2.2.3 The actual tensile strength of the steel of any component shall not exceed the minimum required by the relevant specification by more than 150 N/mm².

4.2.3 Chromium-molybdenum steels. (Applicable to material groups 1.9, 1.10, 1.13 and 1.14 (see table 3).) For chromium-molybdenum steels the contents of carbon and residual elements shall be restricted as follows.

(a) Carbon content:

steels with less than 2 % Cr (nominal):

0.17 % max. (plate)

0.20 % max. (forgings and castings)

steels with more than 2 % Cr (nominal):

0.15 % max. (plate)

0.15 % max. (forgings and castings)

(b) Residual elements:

Copper 0.30 % max.

Nickel 0.40 % max.

Tungsten 0.10 % max.

Tin 0.03 % max.

4.3 Non-metallic materials

For flanges which are lined, or otherwise coated, with non-metallic materials and if the non-metallic materials come, or are likely to come, into contact with potable water then these materials shall comply with BS 6920 : Part 1.

NOTE. Users should be aware that thread sealants or lubricants, for example, should also comply with BS 6920 : Part 1 if used in potable water applications.

5 Bolting

5.1 Materials, dimensions and finish for bolting shall comply with BS 1768, BS 1769 or BS 4882.

NOTE. Where Class 150 or Class 300 steel flanges are bolted to cast iron flanges, the specified minimum yield strength of the bolt material should not exceed 240 N/mm².

5.2 Studbolts shall comply with BS 4882 except that the form shown in figure 3(b) of BS 4882 shall only apply to studbolts of materials other than alloy steel.

5.3 Bolt diameters shall be as given in tables 9 to 14.

Appendix C gives a method for determining the recommended bolt length for lapped-type joints.

Appendix D gives recommended bolt lengths for flanges other than lapped-type.

6 Repairs

Repairs by welding shall be permitted unless otherwise prohibited by the applicable material standard, or product standard in the case of integral flanges, and shall comply with BS 2633, BS 4570 or BS 5135 as appropriate.

NOTE. The welding procedure should be such as to produce a weld having characteristics in accordance with the parent material. Flanges should be heat treated after repair by welding when the material specification requires such treatment.

7 Dimensions

7.1 Flange dimensions

Dimensions (except for dimension G (see note 4)) for each type of flange, other than reducing flanges for each Class designation shall be as given in tables 9 to 14, as qualified by clause 9 and the notes to tables 9 to 14, if appropriate.

NOTE 1. For reducing flanges see 7.5.

NOTE 2. It is incumbent upon the purchaser to specify in the enquiry and/or order if dimensions of flanges are to be affected by clause 9 and/or the notes to tables 9 to 14.

NOTE 3. A summary of the various types of flanges specified showing the nominal sizes applicable to each type and Class designation is given in table 2.

NOTE 4. The centre portion of the face of a blank flange (code 105) need not be machined, provided that the diameter of the unmachined portion does not exceed the recommended shoulder diameter, G , given in tables 9 to 14.

7.2 Hubs

The hubs of slip-on flanges for welding (code 112), threaded flanges (code 113), socket-weld flanges (code 114) and loose flanges for lapped pipe end (code 115) shall be either:

(a) parallel; or

(b) have a draft angle of not more than 7° on the outside surface for forging or casting purposes.

7.3 Threaded flanges

7.3.1 The threads of hubbed threaded flanges (code 113) shall be taper or parallel complying with BS 21, or taper complying with ANSI/ASME B1.20.1 or API Std. 5B.

NOTE. ANSI/ASME B1.20.1 threads will be supplied unless the purchaser specifies otherwise (see appendix A).

7.3.2 Threads shall extend to the flange face and shall be concentric with the axis of the flange. Misalignment shall not exceed 5 mm/m.

Class 150 flanges shall be manufactured without a counter-bore, but to protect the threads, the threads shall be chamfered to the major diameter of the thread at the back of the flange at an angle between 40° and 50° with the axis of the thread. The chamfer shall be concentric with the thread, and shall be included in the measurement of the thread length provided that the chamfer does not exceed one pitch in length.

Class 300, 600, 900, 1500 and 2500 flanges shall be provided with a counterbore as indicated in tables 10 to 14, and the thread shall be chamfered to an angle between 40° and 50° at the bottom of the counterbore. The chamfer shall be concentric with the thread and shall have a major diameter equal to that of the counterbore.

7.3.3 Gauging shall comply with BS 21, ANSI/ASME B1.20.1 or API Std. 5B, as appropriate.

7.4 Weld-neck flanges

For weld-neck flanges (code 111) the thickness of the hub at the welding end shall never be less than 87.5 % of the nominal thickness of the pipe to which the flange is attached (see appendix A).

NOTE. The weld end preparation of weld-neck flanges is outside the scope of this Section of BS 1560. However, appendix E gives details of various weld end preparations and it is incumbent upon the purchaser to specify a particular weld end preparation, if required. The weld end preparation shown in figure 16(a) or 16(b) is the type of preparation normally supplied.

7.5 Reducing flanges (flanges of reduced bore)

7.5.1 General. Flange bolt holes, outside diameters, thickness and the facings of reducing flanges shall be the same as those of the normal flange of the size from which the reduction is being made.

7.5.2 Hub dimensions

7.5.2.1 Threaded and slip-on flanges. The hub dimensions of hubbed threaded (code 113) and slip-on flanges for welding (code 112) shall be at least as large as those of the normal flange of the size to which the reduction is being made. It shall be permitted for the hub to be omitted in certain reducing flanges (see figure 3).

7.5.2.2 Weld-neck flanges. The hub dimensions of weld-neck flanges (code 111) having a reduced bore shall be the same as those of the normal flange of the size to which the reduction is being made.

7.6 Bolt holes

Bolt holes shall be equally spaced on the pitch circle diameter, and in the case of integral flanges, shall be positioned off-centre.

8 Flange facings

8.1 Range of facings

The range of flange facings and flange face designations are given in figure 2. Dimensions of facings shall be as given in figures 4, 5, 6 and 7 and tables 5 and 6.

8.2 Facing dimensions for other than lapped-type joints

NOTE. Facing dimensions for other than lapped-type flange joints apply to flange facings of the 1.6 mm and 6.4 mm high raised face types, the spigot/recess type and tongue/groove type and the ring-joint type (see figures 4 and 5).

Flanges with recess or groove facing or ring-joint groove shall be either raised face or flat face (see appendices A and B).

8.3 Facing dimensions for lapped-type joints

Facings for lapped-type joints (see figure 6) shall be one of the following types (see appendix A):

- (a) raised face (type B);
- (b) tongue/groove (types C and D);
- (c) spigot/recess (types E and F);
- (d) ring-joint (type J).

The facings shall comply with 8.1. The dimension t , indicated in figure 6, shall be not less than the minimum thickness of the barrel of the stub-end, except that in the case of a spigot or tongue facing the dimension t shall be not less than 6.4 mm.

Stub-ends for lapped-type joints shall comply with BS 1640 or ANSI B16.9, as appropriate.

8.4 Flange thickness

In no case, regardless of the type of facing and the tolerances permitted, shall the thickness of a flange be reduced at any point in order to provide adequate height for the facing or adequate depth for the groove.

For Class 150 and Class 300 flanges the 1.6 mm raised face is included in the flange thickness and the heights of other types of faces or depth of groove shall be additional to and shall not reduce the minimum thickness of these flanges (see figure 4).

8.5 Facing finishes

8.5.1 All flange jointing faces shall be machine finished and, when compared by visual or tactile means with reference specimens, shall comply with the values given in tables 7 and 8.

NOTE 1. It is not intended that instrument measurements be taken on the faces themselves and the R_a and R_z values as defined in BS 1134 relate to the reference specimens.

NOTE 2. Requirements for special coatings or finishes should be stated in the enquiry and/or order so that an appropriate allowance may be incorporated in the machining of any relevant mating dimensions (see appendix A).

8.5.2 Flat face, raised face and spigot/recess facings types A, B, E and F shall be machined to comply with table 7.

8.5.3 For tongue and groove and ring-joint facings types C, D and J, the gasket contact surfaces shall be machined to produce a surface finish complying with table 8.

9 Spot facing or back facing of flanges

Any spot facing or back facing shall not reduce the flange thickness to less than the thickness specified. When spot facing is used the diameter shall be large enough to accommodate the outside diameter of the equivalent normal series of washers complying with BS 3410 for the inch bolt size being fitted. The bearing surfaces for the bolting shall be parallel to the flange face within the limits given in table 15.

When a flange is back faced a minimum fillet radius at the hub, as shown in figure 14, shall be maintained as given in table 22.

10 Tolerances

Flanges shall comply with the tolerances specified in table 15.

11 Marking

11.1 Flanges other than integral flanges (see also 11.5)

All flanges other than integral flanges shall be marked as follows:

- (a) the number of this British Standard, i.e. BS 1560*;
- (b) flange code number, e.g. 112;
- (c) Class designation, e.g. 300;

(d) nominal size (inch), e.g. 4. Both sizes shall be included for reducing flanges, e.g. 4/3;

(e) material designation using the material group, British Standard grade of material or identification symbols given in table 3;

(f) manufacturer's name or trade mark;

(g) cast number or melt identification or suitable quality control number traceable to the cast number;

(h) thread identification (see 11.2).

Example. BS 1560/111 - 150 - 2 - 1.2 - XXX - 12345.

11.2 Thread identification

Threaded flanges shall be marked to indicate the type of thread used. Flanges with threads to BS 21 shall be marked Rc or Rp as appropriate followed by the nominal size of the thread, e.g. Rc $\frac{3}{4}$. Flanges with threads to ANSI/ASME B1.20.1 shall be marked with the nominal size of thread, number of threads per inch and the letters NPT, e.g. $\frac{3}{4}$ - 14 NPT. Flanges with threads to API Std 5B shall be marked with API.

11.3 Ring groove number

Flanges grooved for standard ring-joints shall be marked with the letter R and the corresponding ring groove number (see table 6).

11.4 Stamping

When steel stamps are used, the marking shall be positioned on the rim of the flange.

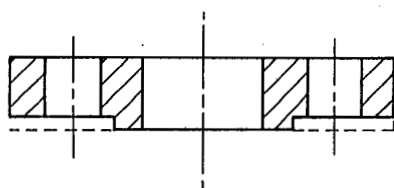
NOTE. Care should be taken to ensure that steel stamp markings are not liable to cause cracks in the flange material.

11.5 Omission of markings

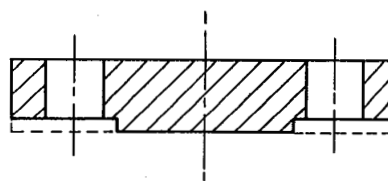
If a flange is too small to enable all the markings required in 11.1 to be marked on the flange, then it is permitted to omit some of the markings. The order in which the markings are omitted shall be as follows:

- (a) size;
- (b) thread type and designation;
- (c) Class designation;
- (d) manufacturer's name or trade mark.

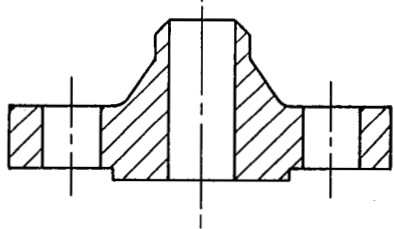
*Marking BS 1560, together with the flange code number, on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of this Section of BS 1560. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.



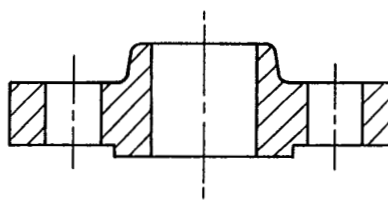
Code 101
Plate flange for welding



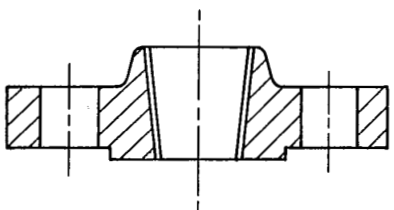
Code 105
Blank flange



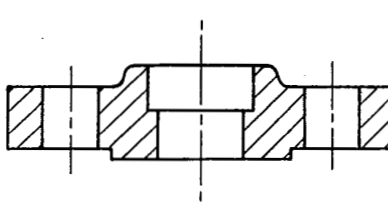
Code 111
Weld-neck flange



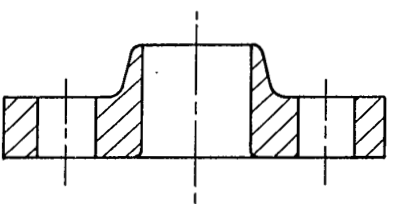
Code 112
Hubbed slip-on flange for welding



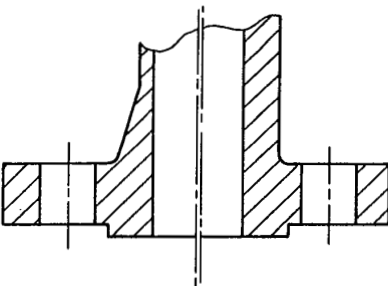
Code 113
Hubbed threaded flange



Code 114
Hubbed socket weld flange



Code 115
Loose hubbed flange for lapped pipe end



Code 121
Integral flange

NOTE. These sketches are diagrammatic only.

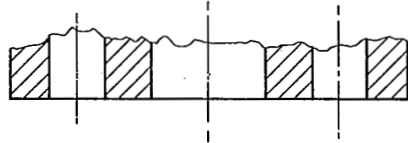
NOTE 1. Codes 101 and 105 comprise flanges that do not incorporate a hub or weld-neck.

NOTE 2. Codes 111 to 115 comprise flanges incorporating a hub or weld-neck and manufactured from forgings or castings.

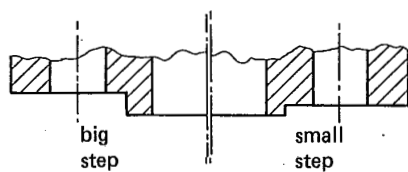
NOTE 3. Code 121 is an integral part of some other equipment or component.

NOTE 4. Flanges may be designated by code numbers or by descriptions.

Figure 1. Flange codes



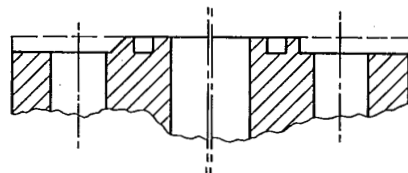
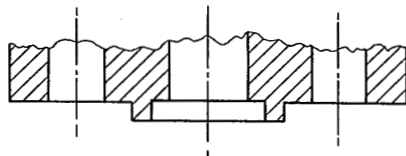
Type A
Flat face



Type B
Raised face

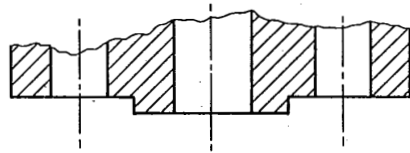
NOTE 1. When provided with a 6.4 mm raised face, type B is identical to type E.

Type C
Tongue

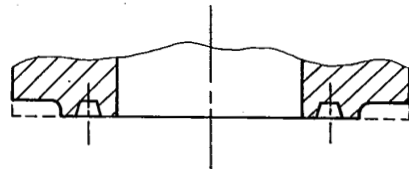
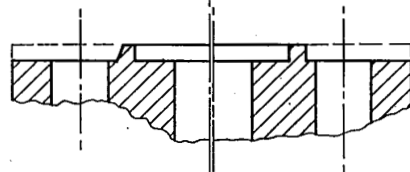


Type D
Groove

Type E
Spigot



Type F
Recess



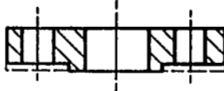
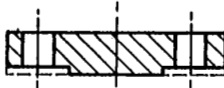
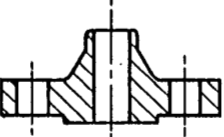
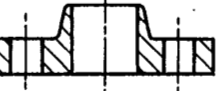
Type J
Ring-joint

NOTE 2. Sketches designated A, B, C, D, E, F and J illustrate the various types of flange facings which may be used in conjunction with the flanges shown in figure 1.

NOTE 3. Facings may be designated by type letters or by descriptions.

Figure 2. Facings of types A to F and J

Table 2. Synoptic table

Flange	Code number	(DN) in Class designation																								
			½ (15)	¾ (20)	1 (25)	1 ¼ (32)	1 ½ (40)	2 (50)	2 ½ (65)	3 (80)	4 (100)	5* (125)	6 (150)	8 (200)	10 (250)	12 (300)	14 (350)	16 (400)	18 (450)	20 (500)	24 (600)					
 Plate	101	150	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
 Blank	105	150	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
		300	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
		600	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
		900	Use Class 1500								X	X	X	X	X	X	X	X	X	X						
		1500	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
		2500	X	X	X	X	X	X	X	X	X	X	X	X	X											
 Weld-neck	111	150	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
		300	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
		600	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
		900	Use Class 1500								X	X	X	X	X	X	X	X	X	X						
		1500	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
		2500	X	X	X	X	X	X	X	X	X	X	X	X	X											
 Hubbed slip-on	112	150	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
		300	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
		600	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
		900	Use Class 1500								X	X	X	X	X	X	X	X	X	X						
		1500	X	X	X	X	X	X	X																	
		2500	X	X	X	X	X	X	X	X	X	X	X	X	X											
 Hubbed threaded	113	150	X	X	X	X	X	X	X	X	X	X														
		300	X	X	X	X	X	X	X	X	X	X														
		600	X	X	X	X	X	X	X	X	X	X														
		900	Use Class 1500								X	X	X	X												
		1500	X	X	X	X	X	X	X	X	X	X														
		2500	X	X	X	X	X	X	X	X	X	X														
 Hubbed socket-weld	114	150	X	X	X	X	X	X	X																	
		300	X	X	X	X	X	X	X																	
		600	X	X	X	X	X	X	X																	
		1500	X	X	X	X	X	X																		
 Loose hubbed for lapped pipe end	115	150	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
		300	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
		600	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
		900	Use Class 1500								X	X	X	X	X	X	X	X	X	X						
		1500	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
		2500	X	X	X	X	X	X	X	X	X	X	X	X												
 Integral	121	150	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
		300	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
		600	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
		900	Use Class 1500								X	X	X	X	X	X	X	X	X	X						
		1500	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
		2500	X	X	X	X	X	X	X	X	X	X	X	X	X											

*These sizes should be avoided in new constructions.

* These sizes should be avoided in new constructions.

Table 3. Materials

Material	Plate				Forgings				Castings				Material group (see note 5)
	ASTM standards	British Standard (see note 1)	Identification symbol	Elevated temperature service (see item in note 3)	ASTM standards	British Standard (see note 1)	Identification symbol	Elevated temperature service (see item in note 3)	ASTM standards	British Standard (see note 1)	Identification symbol	Elevated temperature service (see item in note 3)	
Carbon steel	A515 grade 70	BS 1501: Part 1 164-400	515-70	1, 6	A105	BS 1503-164-490	A105	1, 7	A216 grade WCB	BS 1504-161 Gr 480	WCB	1, 7	1.1
	A516 grade 70		516-70	1, 6	A350 grade LF2		LF2	4					
	A537 Class 1		537 C1	4									
									A216 grade WCC		WCC	1, 7	1.2
2 1/2 % nickel steel	A203 grade B		203 B	1, 7					A352 grade LCC		LCC	4	
3 1/2 % nickel steel	A203 grade E		203 E	1, 7	A350 grade LF3		LF3	4	A352 grade LC2		LC2	4	1.2
Carbon steel	A515 grade 65	BS 1501: Part 1 151-430	515-65	1, 7					A352 grade LC3		LC3	4	1.2
	A516 grade 65	BS 1501: Part 1 161-430	516-65	1, 6					A352 grade LCB	BS 1504-161 Gr 480	LCB	1	1.3
	A515 grade 60		515-60	1, 7	A350 grade LF1		LF1	4					
	A516 grade 60		516-60	1, 6									1.4
Carbon 1/2 % molybdenum steel	A204 grade B		204 B	2, 7					A352 grade LC1		LC1	4	1.5
	A204 grade A		204 A	2, 7	A182 grade F1		F1	2, 7	A217 grade WC1	BS 1504-245	WC1	2, 7	
1 % chromium 1/2 % molybdenum steel					A182 grade F12	BS 1503-620-440*	F12	3, 10					1.9
1 1/4 % chromium 1/2 % molybdenum steel	A387-11 Cl. 2	BS 1501: Part 2 621	11Cl2	3, 10	A182 grade F11	BS 1503-621-460	F11	3, 10	A217 grade WC6	BS 1504-621	WC6	8, 10	1.9
2 1/4 % chromium 1 % molybdenum steel	A387-22 Cl. 2	BS 1501: Part 2 622-515	22Cl2	3, 10	A182 grade F22	BS 1503-622-490	F22	3, 10	A217 grade WC9	BS 1504-622	WC9	8, 10	1.10
5 % chromium 1/2 % molybdenum steel					A182 grade F5a	BS 1503-625-590	F5a		A217 grade C5	BS 1504-625	C5		1.13
9 % chromium 1 % molybdenum steel					A182 grade F9		F9		A217 grade C12	BS 1504-629	C12		1.14
Austenitic-chromium-nickel steel	A240 grade 304	BS 1501: Part 3 304S15†	304	11	A182 grade F304	BS 1503 304S31†	F304	11	A351 grade CF8	BS 1504 304C15†	CF8	11	2.1
	A240 grade 304H	BS 1501: Part 3 304S49†	304H	11	A182 grade F304H	BS 1503 304S51†	F304H	11					
Austenitic-chromium-nickel-molybdenum steel	A240 grade 316	BS 1501: Part 3 316S16†	316	12	A182 grade F316	BS 1503 316S31	F316	12	A351 grade CF8M	BS 1504 316C16†	CF8M	12	2.2
	A240 grade 316H	BS 1501: Part 3 316S49†	316H	12	A182 grade F316H	BS 1503 316S51	F316H	12					
Austenitic-chromium-nickel (low carbon) steel	A240 grade 304L	BS 1501: Part 3 304S12*	304L	5	A182 grade F304L	BS 1503 304S11*	F304L	5					2.3
Austenitic-chromium-nickel-molybdenum (low carbon) steel	A240 grade 316L	BS 1501: Part 3 316S12*	316L	6	A182 grade F316L	BS 1503 316S11	F316L	6					2.3
Austenitic-chromium-nickel (titanium stabilized) steel	A240 grade 321	BS 1501: Part 3 312S12†	321	7	A182 grade F321	BS 1503 321S31†	F321	7					2.4
	A240 grade 321H		321H		A182 grade F321H		F321H						
Austenitic-chromium-nickel (niobium stabilized) steel	A240 grade 347	BS 1501: Part 3 347S17†	347	7	A182 grade F347	BS 1503 347S31†	F347	7	A351 grade CF8C	BS 1504 347C17†	CF8C		2.5
	A240 grade 347H	BS 1501: Part 3 347S49†	347H		A182 grade F347H	BS 1503 347S51†	F347H						
Austenitic-chromium-nickel (25/12 and 23/12 types)	A240 grade 309S	BS 1449: Part 2 309S24†	309S						A351 grade CH8		CH8		2.6
									A351 grade CH20		CH20		
Austenitic-chromium-nickel (25/20 type)	A240 grade 310S	BS 1501: Part 3 301S24†	310S	9	A182 grade F310	BS 1503 310S31†	F310	9	A351 grade CK20		CK20		2.7

* R_{p} min 275 N/mm²
 †0.2 % proof stress 205 N/mm² min.
 ‡0.2 % proof stress 175 N/mm² min.

Notes to table 3

NOTE 1. When selecting materials for flanges the strength requirements (R_e min 275 N/mm², 0.2 % proof stress 205 N/mm² min, 0.2 % proof stress 175 N/mm² min) should be given, as appropriate, on the enquiry and/or order for the flanges (see appendix A).

NOTE 2. For some materials listed under British Standards, testing requirements are more stringent than the comparable ASTM materials and the purchaser is advised to specify any special requirements for the material in the enquiry and/or order for flanges (see appendix A).

NOTE 3. Design and construction standards, e.g. BS 5500 and ANSI B 31.3 differ in requirements for maximum allowable service temperature and may impose lower temperatures than those given below.

- (1) Not recommended for use above 425 °C.
- (2) Not recommended for use above 455 °C.
- (3) Not recommended for use above 590 °C.
- (4) Not to be used over 340 °C.
- (5) Not to be used over 425 °C.
- (6) Not to be used over 455 °C.
- (7) Not to be used over 540 °C.
- (8) Not to be used over 590 °C.
- (9) At service temperatures of 565 °C and above the grain size should not be finer than ASTM6.
- (10) Consideration should be given to the possibility of excessive oxidation (scaling) at temperatures above 565 °C.
- (11) The effects of carbide precipitation should be considered in the case of welded construction or use at temperatures above 480 °C.

(12) The effects of sigma phase formation should be considered at temperatures above 535 °C.

For carbon and carbon-molybdenum steels (notes (1), (2), (4), (6) and (7)) the limitation of the upper temperature is intended to avoid risk of graphitization of the carbides and, also at the higher temperatures, covers the effects of oxidation and reduction in strength.

For chromium-molybdenum ferritic steels (notes (3), (8) and (10)) the limitation of the upper temperature takes account of the effects of oxidation and reduced strength (creep resistance).

For austenitic steels where the material specification states only a maximum for carbon content, e.g. C 0.08 % max, and the proposed service is at temperatures above 540 °C then the steel used should have a carbon content of 0.04 % to 0.08 %.

NOTE 4. Low temperature service (applicable to low temperature (LT) steels and austenitic chromium-nickel steels). Design and construction standards require fracture toughness properties to be determined, usually by Charpy impact testing, on steels for low temperature service. Requirements differ according to the standard and purchasers should state their requirements on the enquiry and/or order for the flanges (see appendix A).

The LT steels (carbon and nickel steels) included in this Section of BS 1560 have Charpy impact test requirements specified in the relevant standard for the materials. In the case of austenitic stainless steels it is not usual to require Charpy impact tests for services above -200 °C.

NOTE 5. Material groups are those given in ANSI B16.5.

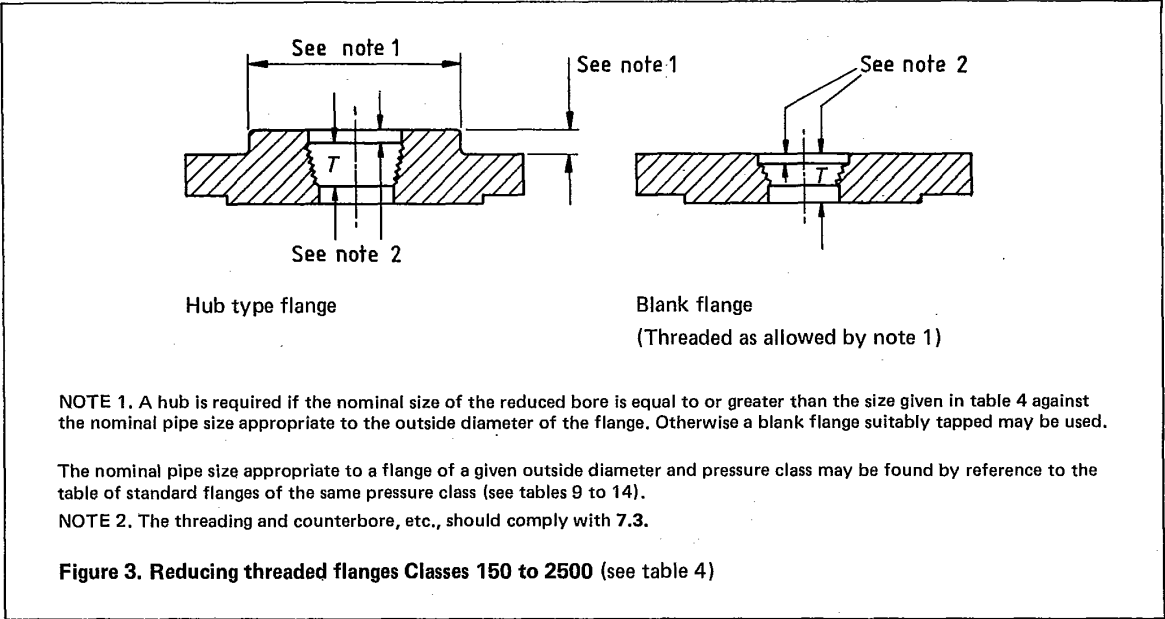
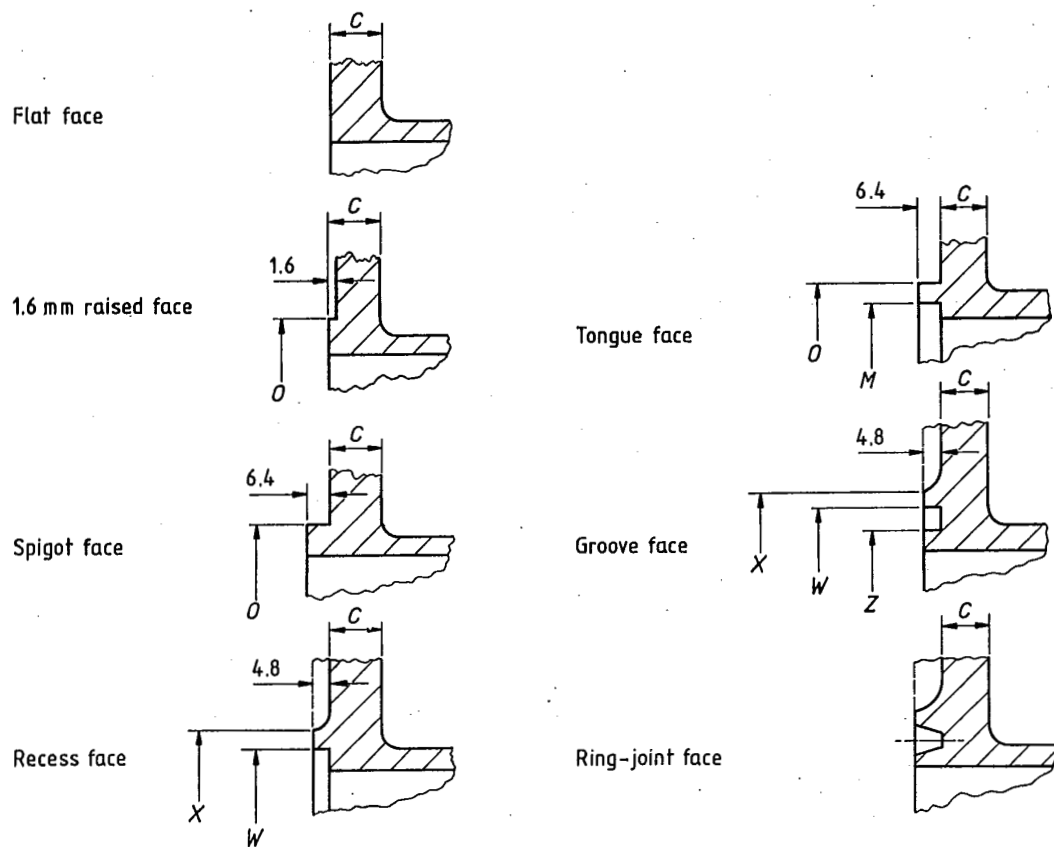


Table 4. Reducing threaded flanges Classes 150 to 2500		
Nominal pipe size appropriate to the diameter of the flange		Smallest nominal size of reduced bore requiring hub (see note 1 to figure 3)
in	DN	in
1	25	1/2
*1 1/4	32	1/2
1 1/2	40	1/2
2	50	1
*2 1/2	65	1 1/4
3	80	1 1/4
4	100	1 1/2
*5	125	1 1/2
6	150	2 1/2
8	200	3
10	250	4
12	300	4
14	350	4
16	400	4
18	450	4
20	500	4
24	600	4

*The use of these sizes should be avoided in new constructions.
NOTE. This table should be read in conjunction with 7.5.2.1.



All dimensions are in millimetres.

NOTE 1. For dimensions X , O , M , W , Z and other details for facings other than ring-joint, see table 5, 8.2 and clause 10.

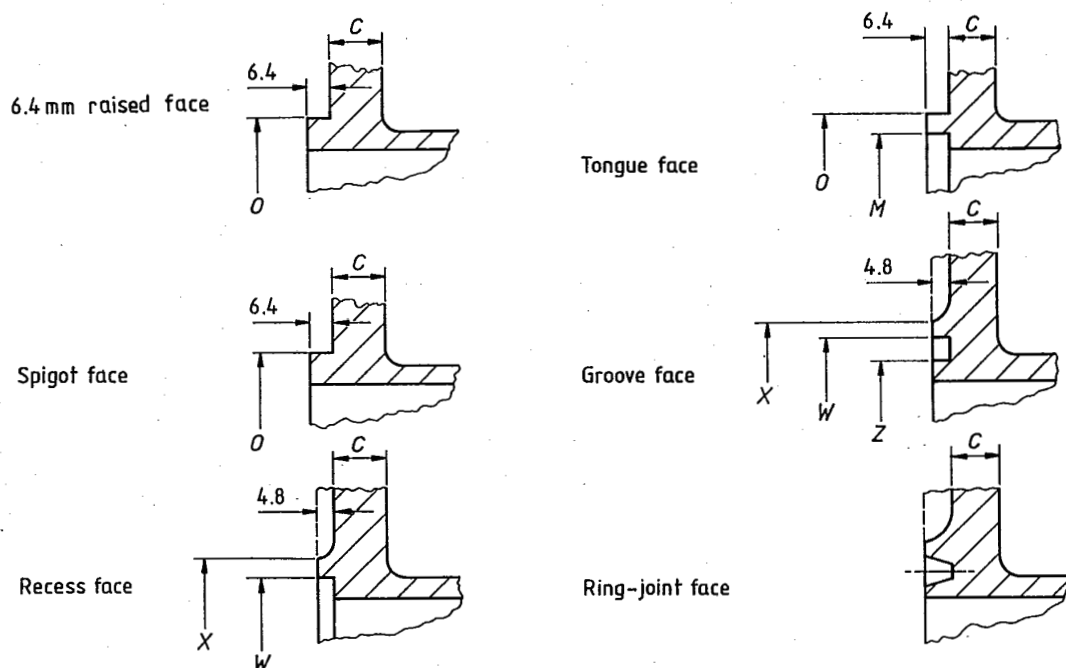
NOTE 2. For other dimensions and details of ring-joint facings, see table 6, 8.2 and clause 10.

NOTE 3. C is the minimum flange thickness (see tables 9 and 10).

NOTE 4. Dotted lines indicate full-face; for permissible applications see 8.2.

NOTE 5. Spigot/recess and tongue/groove faces are not applicable to Class 150 because of potential dimensional conflicts.

Figure 4. Flange facings, Classes 150 and 300 only, for other than lapped-type joints



All dimensions are in millimetres.

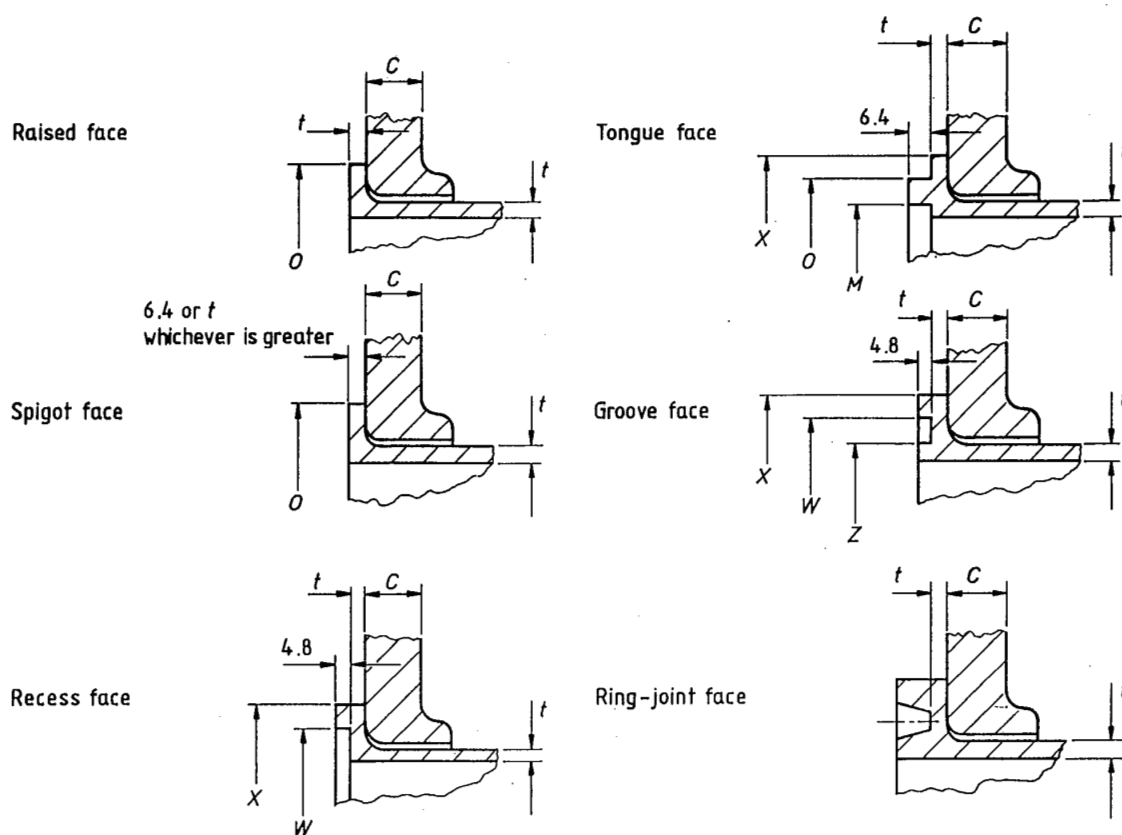
NOTE 1. For dimensions X , O , M , W , Z and other details for facings other than ring-joint, see table 5, 8.2 and clause 10.

NOTE 2. For other dimensions and details of ring-joint facings, see table 6, 8.2 and clause 10.

NOTE 3. C is the minimum flange thickness (see tables 11, 12, 13 and 14).

NOTE 4. Dotted lines indicate full-face; for permissible applications see 8.2.

Figure 5. Flange facings, Classes 600 to 2500, for other than lapped-type joints



All dimensions are in millimetres.

NOTE 1. For dimensions X , O , M , W , Z and other details for facings other than ring-joint, see table 5, 8.3 and clause 10.

NOTE 2. For other dimensions and details of ring-joint facings, see table 6, 8.3 and clause 10.

NOTE 3. C is the minimum flange thickness (see tables 9, 10, 11, 12, 13 and 14).

NOTE 4, t = thickness of barrel of stub-end (see 8.3 and BS 1640).

Figure 6. Facings for lapped-type joints

Table 5. Facing dimensions for flanges other than ring-joint, Classes 150 to 2500									
Nominal pipe size		Outside diameter of raised face, spigot (see note 3)	Inside diameter of tongue	Outside diameter of recess (see note 3)	Inside diameter of recess	Height of raised face		Depth of recess or groove	Minimum outside diameter of raised portion of recess or groove (see notes 3 and 4)
						Classes 150 and 300 (see note 5)	Classes 600 to 2500 (see note 6)		
		<i>O</i>	<i>M</i>	<i>W</i>	<i>Z</i>				<i>X</i>
in	DN	mm	mm	mm	mm	mm	mm	mm	mm
1/2	15	34.9	25.4	36.5	23.8	1.6	6.4	4.8	46.0
3/4	20	42.9	33.3	44.4	31.7	1.6	6.4	4.8	54.0
1	25	50.8	38.1	52.4	36.5	1.6	6.4	4.8	62.0
*1 1/4	32	63.5	47.6	65.1	46.0	1.6	6.4	4.8	75.0
1 1/2	40	73.0	54.0	74.6	52.4	1.6	6.4	4.8	84.0
2	50	92.1	73.0	93.7	71.4	1.6	6.4	4.8	103.0
*2 1/2	65	104.8	85.7	106.4	84.1	1.6	6.4	4.8	116.0
3	80	127.0	107.9	128.6	106.4	1.6	6.4	4.8	138.0
4	100	157.2	131.8	158.8	130.2	1.6	6.4	4.8	168.0
*5	125	185.7	160.3	187.3	158.7	1.6	6.4	4.8	197.0
6	150	215.9	190.5	217.5	188.9	1.6	6.4	4.8	227.0
8	200	269.9	238.1	271.5	236.5	1.6	6.4	4.8	281.0
10	250	323.8	285.7	325.4	284.1	1.6	6.4	4.8	335.0
12	300	381.0	342.9	382.6	341.3	1.6	6.4	4.8	392.0
14	350	412.7	374.6	414.3	373.1	1.6	6.4	4.8	424.0
16	400	469.9	425.4	471.5	423.9	1.6	6.4	4.8	481.0
18	450	533.4	488.9	535.0	487.4	1.6	6.4	4.8	545.0
20	500	584.2	533.4	585.8	531.8	1.6	6.4	4.8	595.0
24	600	692.1	641.3	693.7	639.8	1.6	6.4	4.8	703.0

*The use of these sizes should be avoided in new constructions.

NOTE 1. This table should be read in conjunction with 8.2, 8.3 and figures 4, 5 and 6.

NOTE 2. For ring-joint facing dimensions see table 6.

NOTE 3. Spigot/recess and tongue/groove facings are not applicable to Class 150 because of potential dimensional conflicts.

NOTE 4. A flange with a recess facing may be supplied with the outside diameter of the raised portion to dimension *X* above as appropriate, or full faced.

NOTE 5. Raised face height is included in the flange thickness.

NOTE 6. Raised face height is additional to the minimum flange thickness.

NOTE 7. For tolerances see table 15.

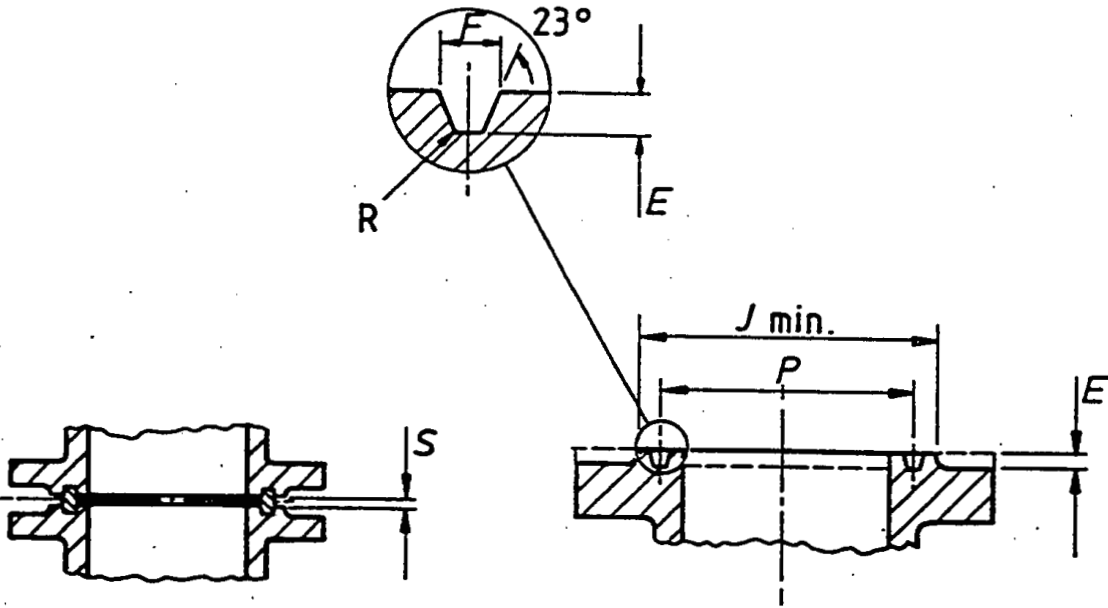


Figure 7. Dimensions of ring-joint facings (all Classes) (see table 6)

Table 6. Dimensions of ring-joint facings (all Classes) (see figure 7)

Table 6. Dimensions of ring-joint facings (all Classes) (see figure 7)																											
Pipe nominal size												Groove number	Groove dimensions				Diameter of raised portion, J min.					Approximate distance between flanges S, when ring is compressed					
Class 150		Class 300		Class 600		Class 900		Class 1500		Class 2500			Pitch dia.	Depth	Width	Radius at bottom	Class 150	Class 300 and Class 600	Class 900	Class 1500	Class 2500	Class 150	Class 300	Class 600	Class 900	Class 1500	Class 2500
in	DN	in	DN	in	DN	in	DN	in	DN	in	DN		P	E	F	R _{max.}	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
—	—	1/2	15	1/2	15	—	—	—	—	—	—	R 11	34.13	5.56	7.14	0.8	—	50.8	—	—	—	—	3	3	—	—	—
—	—	—	—	—	—	—	—	1/2	15	—	—	R 12	39.69	6.35	8.73	0.8	—	—	—	60.3	—	—	—	—	4	—	—
—	—	3/4	20	3/4	20	—	—	—	—	1/2	15	R 13	42.86	6.35	8.73	0.8	—	63.5	—	—	65.1	—	4	4	—	—	4
—	—	—	—	—	—	—	—	3/4	20	—	—	R 14	44.45	6.35	8.73	0.8	—	—	—	66.7	—	—	—	—	4	—	—
1	25	—	—	—	—	—	—	—	—	—	—	R 15	47.63	6.35	8.73	0.8	63.5	—	—	—	—	4	—	—	—	—	—
—	—	1	25	1	25	—	—	1	25	3/4	20	R 16	50.80	6.35	8.73	0.8	—	69.8	—	71.4	73.0	—	4	4	—	4	4
1 1/4	32	—	—	—	—	—	—	—	—	—	—	R 17	57.15	6.35	8.73	0.8	73.0	—	—	—	—	4	—	—	—	—	—
—	—	1 1/4	32	1 1/4	32	—	—	1 1/4	32	1	25	R 18	60.33	6.35	8.73	0.8	—	79.4	—	81.0	82.5	—	4	4	—	4	4
1 1/2	40	—	—	—	—	—	—	—	—	—	—	R 19	65.09	6.35	8.73	0.8	82.6	—	—	—	—	4	—	—	—	—	—
—	—	1 1/2	40	1 1/2	40	—	—	1 1/2	40	—	—	R 20	68.26	6.35	8.73	0.8	—	90.5	—	92.1	—	—	4	4	—	4	—
—	—	—	—	—	—	—	—	—	—	1 1/4	32	R 21	72.23	7.94	11.91	0.8	—	—	—	—	101.6	—	—	—	—	—	3
2	50	—	—	—	—	—	—	—	—	—	—	R 22	82.55	6.35	8.73	0.8	101.6	—	—	—	—	4	—	—	—	—	—
—	—	2	50	2	50	—	—	—	—	1 1/2	40	R 23	82.55	7.94	11.91	0.8	—	108.0	—	—	114.3	—	6	5	—	—	3
—	—	—	—	—	—	—	—	2	50	—	—	R 24	95.25	7.94	11.91	0.8	—	—	—	123.8	—	—	—	—	3	—	—
2 1/2	65	—	—	—	—	—	—	—	—	—	—	R 25	101.60	6.35	8.73	0.8	120.6	—	—	—	—	4	—	—	—	—	—
—	—	2 1/2	65	2 1/2	65	—	—	—	—	2	50	R 26	101.60	7.94	11.91	0.8	—	127	—	—	133.4	—	6	5	—	—	3
—	—	—	—	—	—	—	—	2 1/2	65	—	—	R 27	107.95	7.94	11.91	0.8	—	—	—	136.5	—	—	—	—	3	—	
—	—	—	—	—	—	—	—	—	—	2 1/2	65	R 28	111.13	9.52	13.49	1.6	—	—	—	—	149.2	—	—	—	—	—	3
3	80	—	—	—	—	—	—	—	—	—	—	R 29	114.30	6.35	8.73	0.8	133.4	—	—	—	—	4	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	R 30	117.48	7.94	11.91	0.8	—	—	—	—	—	—	—	—	—	—	—
—	—	3	80	3	80	3	80	—	—	—	—	R 31	123.83	7.94	11.91	0.8	—	146.0	155.6	—	—	—	6	5	4	—	—
—	—	—	—	—	—	—	—	—	—	3	80	R 32	127.00	9.52	13.49	1.6	—	—	—	—	168.3	—	—	—	—	—	3
—	—	—	—	—	—	—	—	—	—	—	—	R 33	131.76	6.35	8.73	0.8	154.0	—	—	—	—	4	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	R 34	131.76	7.94	11.91	0.8	—	158.8	—	—	—	—	6	5	—	—	—
—	—	—	—	—	—	—	—	3	80	—	—	R 35	136.53	7.94	11.91	0.8	—	—	—	168.3	—	—	—	—	3	—	—
4	100	—	—	—	—	—	—	—	—	—	—	R 36	149.23	6.35	8.73	0.8	171.4	—	—	—	—	4	—	—	—	—	—
—	—	4	100	4	100	4	100	—	—	—	—	R 37	149.23	7.94	11.91	0.8	—	174.6	181.0	—	—	—	6	5	4	—	—
—	—	—	—	—	—	—	—	—	—	4	100	R 38	157.16	11.11	16.67	0.8	—	—	—	—	203.2	—	—	—	—	—	4
—	—	—	—	—	—	—	—	—	—	—	—	R 39	161.93	7.94	11.91	0.8	—	—	—	193.7	—	—	—	—	3	—	—
5	125	—	—	—	—	—	—	—	—	—	—	R 40	171.45	6.35	8.73	0.8	193.7	—	—	—	—	4	—	—	—	—	—

NOTE. Tolerances are given in table 15.

NOTE. Tolerances are given in table 15.

Table 6. (continued)																											
Pipe nominal size												Groove number	Groove dimensions				Diameter of raised portion, J min.					Approximate distance between flanges S, when ring is compressed					
Class 150		Class 300		Class 600		Class 900		Class 1500		Class 2500			Pitch dia.	Depth	Width	Radius at bottom	Class 150	Class 300 and Class 600	Class 900	Class 1500	Class 2500	Class 150	Class 300	Class 600	Class 900	Class 1500	Class 2500
in	DN	in	DN	in	DN	in	DN	in	DN	in	DN		P	E	F	R _{max.}	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
—	—	5	125	5	125	5	125	—	—	—	—	R 41	180.98	7.94	11.91	0.8	—	209.6	215.9	—	—	—	6	5	4	—	—
—	—	—	—	—	—	—	—	—	—	5	125	R 42	190.50	12.70	19.84	1.6	—	—	—	241.3	—	—	—	—	—	—	4
6	150	—	—	—	—	—	—	—	—	—	—	R 43	193.68	6.35	8.73	0.8	219.1	—	—	—	—	4	—	—	—	—	—
—	—	—	—	—	—	—	—	5	125	—	—	R 44	193.68	7.94	11.91	0.8	—	—	—	228.6	—	—	—	—	—	3	—
—	—	6	150	6	150	6	150	—	—	—	—	R 45	211.14	7.94	11.91	0.8	—	241.3	241.3	—	—	—	6	5	4	—	—
—	—	—	—	—	—	—	—	6	150	—	—	R 46	211.14	9.53	13.49	1.6	—	—	—	247.6	—	—	—	—	—	3	—
8	200	—	—	—	—	—	—	—	—	6	150	R 47	228.60	12.70	19.84	1.6	—	—	—	279.4	—	—	—	—	—	—	4
—	—	—	—	—	—	—	—	—	—	—	—	R 48	247.65	6.35	8.73	0.8	273.0	—	—	—	—	4	—	—	—	—	—
—	—	8	200	8	200	8	200	—	—	—	—	R 49	269.88	7.94	11.91	0.8	—	301.6	308.0	—	—	—	6	5	4	—	—
—	—	—	—	—	—	—	—	8	200	—	—	R 50	269.88	11.11	16.67	1.6	—	—	—	317.5	—	—	—	—	—	4	—
—	—	—	—	—	—	—	—	—	—	8	200	R 51	279.40	14.29	23.02	1.6	—	—	—	339.7	—	—	—	—	—	—	5
10	250	—	—	—	—	—	—	—	—	—	—	R 52	304.80	6.35	8.73	0.8	330.2	—	—	—	—	4	—	—	—	—	—
—	—	10	250	10	250	10	250	—	—	—	—	R 53	323.85	7.94	11.91	0.8	—	355.6	362.0	—	—	—	6	5	4	—	—
—	—	—	—	—	—	—	—	10	250	—	—	R 54	323.85	11.11	16.67	1.6	—	—	—	371.5	—	—	—	—	—	4	—
—	—	—	—	—	—	—	—	—	—	10	250	R 55	342.90	17.46	30.16	2.4	—	—	—	425.4	—	—	—	—	—	—	6
—	—	—	—	—	—	—	—	—	—	—	—	R 56	381.00	6.35	8.73	0.8	406.4	—	—	—	—	4	—	—	—	—	—
—	300	—	—	—	—	—	—	—	—	—	—	R 57	381.00	7.94	11.91	0.8	—	412.8	419.1	—	—	—	6	5	4	—	—
—	—	12	300	12	300	12	300	—	—	—	—	R 58	381.00	14.29	23.02	1.6	—	—	—	438.1	—	—	—	—	—	5	—
14	350	—	—	—	—	—	—	—	—	—	—	R 59	396.88	6.35	8.73	0.8	425.4	—	—	—	—	3	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	12	300	R 60	406.40	17.46	33.34	2.4	—	—	—	495.3	—	—	—	—	—	—	8
—	—	14	350	14	350	—	—	—	—	—	—	R 61	419.10	7.94	11.91	0.8	—	457.2	—	—	—	—	6	5	—	—	—
—	—	—	—	—	—	14	350	—	—	—	—	R 62	419.10	11.11	16.67	1.6	—	—	466.7	—	—	—	—	—	4	—	—
—	—	—	—	—	—	—	—	14	350	—	—	R 63	419.10	15.88	26.99	2.4	—	—	—	488.9	—	—	—	—	—	6	—
16	400	—	—	—	—	—	—	—	—	—	—	R 64	454.03	6.35	8.73	0.8	482.6	—	—	—	—	3	—	—	—	—	—
—	—	16	400	16	400	—	—	—	—	—	—	R 65	469.90	7.94	11.91	0.8	—	508.0	—	—	—	—	6	5	—	—	—
—	—	—	—	—	—	16	400	—	—	—	—	R 66	469.90	11.11	16.67	1.6	—	—	523.9	—	—	—	—	—	4	—	—
—	—	—	—	—	—	—	16	400	—	—	—	R 67	469.90	17.46	30.16	2.4	—	—	—	546.1	—	—	—	—	—	8	—
18	450	—	—	—	—	—	—	—	—	—	—	R 68	517.53	6.35	8.73	0.8	546.1	—	—	—	—	3	—	—	—	—	—
—	—	18	450	18	450	—	—	—	—	—	—	R 69	533.40	7.94	11.91	0.8	—	574.7	—	—	—	—	6	5	—	—	—
—	—	—	—	—	—	18	450	—	—	—	—	R 70	533.40	12.70	19.84	1.6	—	—	593.7	—	—	—	—	—	5	—	—

Table 6. (concluded)

Pipe nominal size												Groove number	Groove dimensions				Diameter of raised portion, J min.					Approximate distance between flanges S, when ring is compressed					
Class 150		Class 300		Class 600		Class 900		Class 1500		Class 2500			Pitch dia.	Depth	Width	Radius at bottom	Class 150	Class 300 and Class 600	Class 900	Class 1500	Class 2500	Class 150	Class 300	Class 600	Class 900	Class 1500	Class 2500
in	DN	in	DN	in	DN	in	DN	in	DN	in	DN		P	E	F	R _{max.}	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
—	—	—	—	—	—	—	—	18	450	—	—	R 71	533.40	17.46	30.16	2.4	—	—	—	612.8	—	—	—	—	8	—	
20	500	—	—	—	—	—	—	—	—	—	—	R 72	558.80	6.35	8.73	0.8	596.9	—	—	—	—	3	—	—	—	—	
—	—	20	500	20	500	—	—	—	—	—	—	R 73	584.20	9.53	13.49	1.6	—	635.0	—	—	—	—	6	5	—	—	
—	—	—	—	—	—	20	500	—	—	—	—	R 74	584.20	12.70	19.84	1.6	—	—	647.7	—	—	—	—	5	—	—	
—	—	—	—	—	—	—	—	20	500	—	—	R 75	584.20	17.46	33.34	2.4	—	—	—	673.1	—	—	—	—	10	—	
24	600	—	—	—	—	—	—	—	—	—	—	R 76	673.10	6.35	8.73	0.8	711.2	—	—	—	—	3	—	—	—	—	
—	—	24	600	24	600	—	—	—	—	—	—	R 77	692.15	11.11	16.67	1.6	—	749.3	—	—	—	—	6	6	—	—	
—	—	—	—	—	—	24	600	—	—	—	—	R 78	692.15	15.88	26.99	2.4	—	—	771.5	—	—	—	—	6	—	—	
—	—	—	—	—	—	—	—	24	600	—	—	R 79	692.15	20.64	36.51	2.4	—	—	—	793.8	—	—	—	—	11	—	

NOTE 1. For ring-joints with lapped flanges in Class 300 and 600, ring and groove number R 30 are used instead of R 31.

NOTE 2. For facing requirements for lapped joints, see 8.3 and figure 6.

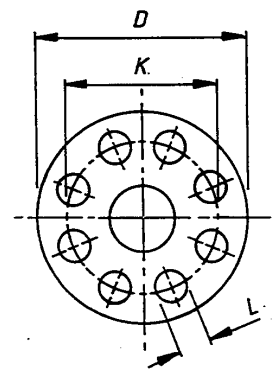
NOTE 3. Height of raised portion is equal to the depth of groove *E* but is not subject to the tolerance for *E*. The former full face contour may be used.

NOTE 4. For sizes 1/2 in (DN 15) to 2 1/2 in (DN 65) Class 1500 flanges are used instead of Class 900.

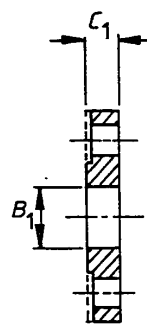
Table 7. Surface finish for facings A, B, E and F

Flange rating	Method of machining	Approximate depth of serration	Approximate radius of tool nose	Approximate pitch of serration	R_z		R_a	
					min.	max.	min.	max.
Class 150 to Class 2500 inclusive	Turning	mm 0.05	mm 1.6	mm 0.8	μm 12.5	μm 50	μm 3.2	μm 12.5
	Other than turning	—	—	—	12.5	25	3.2	6.3
NOTE 1. R_a and R_z are defined in BS 1134. NOTE 2. Turning includes any method of machine operation producing either serrated concentric or serrated spiral grooves. NOTE 3. For certain applications, e.g. for searching media such as low temperature gases and for flanges of Class 900 and above, it may be necessary to stipulate closer control on the surface finish.								

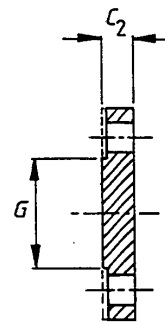
Table 8. Surface finish for facings C, D and J				
Facing	R_z		R_a	
	min.	max.	min.	max.
Tongue and groove	μm	μm	μm	μm
	3.2	12.5	0.8	3.2
Ring-joint groove (including side walls)	1.6	6.3	0.4	1.6



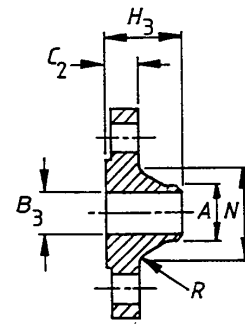
This diagram illustrates the arrangement but not necessarily the correct number of bolt holes.



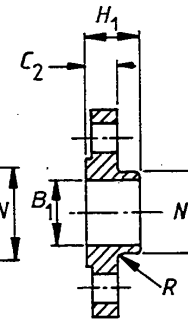
Code 101
Plate flange for welding



Code 105
Blank flange



Code 111
Weld-neck flange

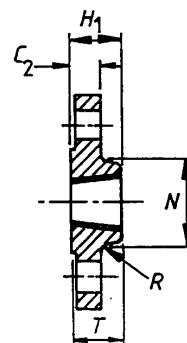


Code 112
Hubbed slip-on flange for welding

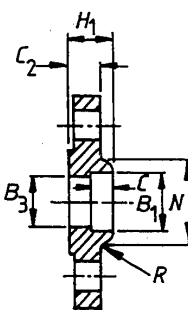
NOTE 1. The C_1 and C_2 dimensions include 1.6 mm raised face but other facings will increase the thickness (see figure 4).

NOTE 2. Dimension N is measured at the intersection of the projections of the hub drift angle and the back face of the flange.

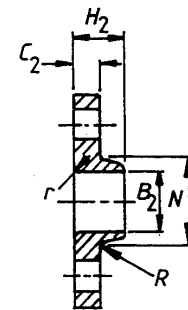
NOTE 3. Alternative forms are indicated by the use of dotted lines.



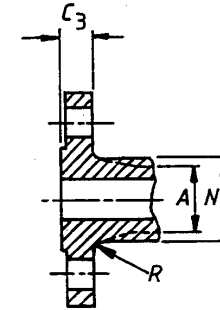
Code 113
Hubbed threaded flange



Code 114
Hubbed socket weld flange



Code 115
Loose hubbed flange
for lapped pipe end



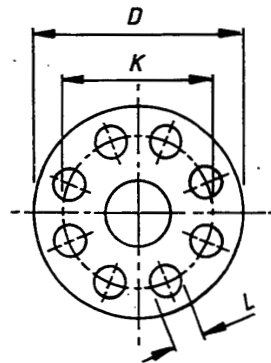
Code 121
Integral flange

Figure 8. Dimensions of Class 150 flanges (see table 9)

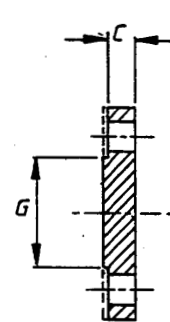
Table 9. Dimensions of Class 150 flanges (see figure 8)

Nominal size	Outside diameter of flange	Mating dimensions				Flange thickness			Hub diameter	Hub diameter at weld end	Length through hub			Minimum thread length of threaded flange	Bore			Corner radius of bore of lapped flange and pipe	Depth of socket	Shoulder diameter	Hub radius		
		Diameter of bolt circle	Diameter of bolt holes	Number of bolts	Nominal diameter of bolts	Threaded; slip-on; socket weld	Lapped	Weld neck			Plate; slip-on; socket weld	Lapped	Weld neck socket weld										
															C ₁	C ₂	C ₃					H ₁	H ₂
Codes affected	101, 105, 111, 112, 113, 114, 115, 121					101	105, 113, 111, 114, 112, 115		121	111, 112, 113, 114, 115, 121		111, 121	112, 113, 114	115	111	113	101, 112, 114	115	111, 114	115	114	105	111, 114, 112, 115, 113, 121
in	DN	mm	mm	in (mm)		in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1/2	15	89	60.3	5/8 (15.9)	4	1/2	12.0	11.1	11.1	30	21.3	15.9	15.9	47.6	15.9	22.4	23.0	3.0	9.5	—	—	3	
3/4	20	98	69.8	5/8 (15.9)	4	1/2	14.0	12.7	11.1	38	26.7	15.9	15.9	52.4	15.9	27.7	28.0	3.0	11.0	—	—	3	
1	25	108	79.4	5/8 (15.9)	4	1/2	16.0	14.3	11.1	49	33.4	17.5	17.5	55.6	17.5	34.5	35.0	3.0	12.5	—	—	3	
*1 1/4	32	117	88.9	5/8 (15.9)	4	1/2	18.0	15.9	12.7	59	42.2	20.6	20.6	57.2	20.6	43.2	43.5	5.0	14.5	—	—	3	
1 1/2	40	127	98.4	5/8 (15.9)	4	1/2	19.0	17.5	14.3	65	48.3	22.2	22.2	61.9	22.2	49.5	50.0	6.5	16.0	—	—	3	
2	50	152	120.6	3/4 (19.0)	4	5/8	21.0	19.0	15.9	78	60.3	25.4	25.4	63.5	25.4	62.0	62.5	8.0	17.5	—	—	3	
*2 1/2	65	178	139.7	3/4 (19.0)	4	5/8	24.0	22.2	17.5	90	73.0	28.6	28.6	69.9	28.6	74.7	75.5	8.0	19.0	38	—	3	
3	80	190	152.4	3/4 (19.0)	4	5/8	26.0	23.8	19.0	108	88.9	30.2	30.2	69.9	30.2	90.7	91.5	9.5	20.5	51	—	3	
4	100	229	190.5	3/4 (19.0)	8	5/8	27.0	23.8	23.8	135	114.3	33.3	33.3	76.2	33.3	116.1	117.0	11.0	—	76	—	3	
*5	125	254	215.9	7/8 (22.2)	8	3/4	28.0	23.8	23.8	164	141.3	36.5	36.5	88.9	36.5	143.8	145.0	11.0	—	102	—	6.5	
6	150	279	241.3	7/8 (22.2)	8	3/4	31.0	25.4	25.4	192	168.3	39.7	39.7	88.9	39.7	170.7	171.0	12.5	—	127	—	6.5	
8	200	343	298.4	7/8 (22.2)	8	3/4	34.0	28.6	28.6	246	219.1	44.5	44.5	101.6	—	221.5	222.0	12.5	—	200	—	6.5	
10	250	406	362.0	1 (25.4)	12	7/8	38.0	30.2	30.2	305	273.0	49.2	49.2	101.6	—	276.4	277.0	12.5	—	225	—	6.5	
12	300	483	431.8	1 (25.4)	12	7/8	42.0	31.8	31.8	365	323.9	55.6	55.6	114.3	—	327.2	328.0	12.5	—	279	—	9.5	
14	350	533	476.2	1 1/8 (28.6)	12	1	43.0	34.9	34.9	400	355.6	57.2	79.4	127.0	—	359.2	360.0	12.5	—	311	—	9.5	
16	400	597	539.8	1 1/8 (28.6)	16	1	48.0	36.5	36.5	457	406.4	63.5	87.3	127.0	—	410.5	411.0	12.5	—	362	—	9.5	
18	450	635	577.8	1 1/4 (31.8)	16	1 1/8	56.0	39.7	39.7	505	457.2	68.3	96.8	139.7	—	461.8	462.0	12.5	—	413	—	9.5	
20	500	698	635.0	1 1/4 (31.8)	20	1 1/8	59.0	42.9	42.9	559	508.0	73.0	103.2	144.5	—	513.1	514.0	12.5	—	463	—	9.5	
24	600	813	749.3	1 3/8 (34.9)	20	1 1/4	62.0	47.6	47.6	664	609.6	82.6	111.1	152.4	—	616.0	616.0	12.5	—	565	—	9.5	

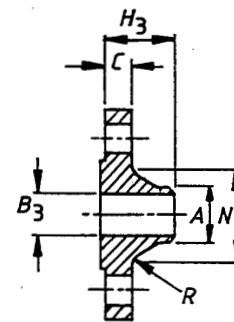
*The use of these sizes should be avoided in new constructions.
NOTE 1. For facing dimensions see table 5.
NOTE 2. See notes following table 14.



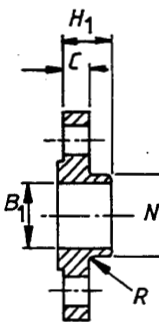
This diagram illustrates the arrangement but not necessarily the correct number of bolt holes.



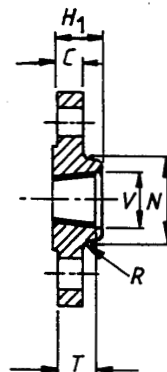
Code 105
Blank flange



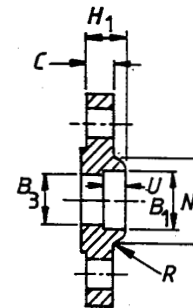
Code 111
Weld neck flange



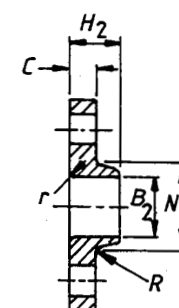
Code 112
Hubbed slip-on flange for welding



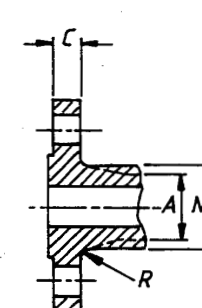
Code 113
Hubbed threaded flange



Code 114
Hubbed socket weld flange



Code 115
Loose hubbed flange
for lapped pipe end



Code 121
Integral flange

NOTE 1. The C dimensions include 1.6 mm raised face but other facings will increase the thickness (see figure 4).

NOTE 2. Dimension N is measured at the intersection of the projections of the hub drift angle and the back face of the flange.

NOTE 3. Alternative forms are indicated by the use of dotted lines.

Figure 9. Dimensions of Class 300 flanges (see table 10)

Table 10. Dimensions of Class 300 flanges (see figure 9)

Nominal size	Outside diameter of flange	Mating dimensions				Flange thickness	Hub diameter	Hub diameter at weld end	Length through hub			Minimum thread length of threaded flange	Bore			Corner radius of bore of flange and pipe	Depth of socket	Minimum diameter of counter-bore threaded flange	Shoulder diameter	Hub radius
		Diameter of bolt circle	Diameter of bolt holes	Number of bolts	Nominal diameter of bolts				Threaded; slip-on; socket weld	Lapped	Weld neck		Slip-on; socket weld	Lapped	Weld neck socket weld					
	D	K	L			C	N	A	H ₁	H ₂	H ₃	T	B ₁	B ₂	B ₃	r	U	V	G	R min.
Codes affected	105, 111, 112, 113, 114, 115, 121					105, 111, 112, 113, 114, 115, 121	111, 112, 113, 114, 115, 121	111, 121	112, 113, 114	115	111	113	112, 114	115	111, 114	115	114	113	105	111, 114, 112, 115, 113, 121
in	DN	mm	mm	in (mm)		in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1/2	15	95	66.7	5/8 (15.9)	4	1/2	14.3	38	21.3	22.2	22.2	52.4	16	22.4	23.0	3.0	9.5	23.5	—	3
3/4	20	117	82.6	3/4 (19.0)	4	5/8	15.9	48	26.7	25.4	25.4	57.2	16	27.7	28.0	3.0	11.0	29.0	—	3
1	25	124	88.9	3/4 (19.0)	4	5/8	17.5	54	33.4	27.0	27.0	61.9	17	34.5	35.0	3.0	12.5	36.0	—	3
*1 1/4	32	133	98.4	3/4 (19.0)	4	5/8	19.0	64	42.2	27.0	27.0	65.1	21	43.2	43.5	5.0	14.5	44.5	—	3
1 1/2	40	156	114.3	7/8 (22.2)	4	3/4	20.6	70	48.3	30.2	30.2	68.3	22	49.5	50.0	6.5	16.0	50.5	—	3
2	50	165	127.0	3/4 (19.0)	8	5/8	22.2	84	60.3	33.3	33.3	69.9	29	62.0	62.5	8.0	17.5	63.5	—	3
*2 1/2	65	190	149.2	7/8 (22.2)	8	3/4	25.4	100	73.0	38.1	38.1	76.2	32	74.7	75.5	8.0	19.0	76.0	38	3
3	80	210	168.3	7/8 (22.2)	8	3/4	28.6	117	88.9	42.9	42.9	79.4	32	90.7	91.5	9.5	20.5	92.0	51	3
4	100	254	200.0	7/8 (22.2)	8	3/4	31.8	146	114.3	47.6	47.6	85.7	37	116.1	117.0	9.5	—	118.0	76	3
*5	125	279	235.0	7/8 (22.2)	8	3/4	34.9	178	141.3	50.8	50.8	98.4	43	143.8	145.0	11.0	—	145.0	102	6.5
6	150	318	269.9	7/8 (22.2)	12	3/4	36.5	206	168.3	52.4	52.4	98.4	46	170.7	171.0	12.5	—	171.0	127	6.5
8	200	381	330.2	1 (25.4)	12	7/8	41.3	260	219.1	61.9	61.9	111.1	—	221.5	222.0	12.5	—	—	200	6.5
10	250	444	387.4	1 1/8 (28.6)	16	1	47.6	321	273.0	66.8	95.3	117.5	—	276.4	277.0	12.5	—	—	225	6.5
12	300	521	450.8	1 1/4 (31.8)	16	1 1/8	50.8	375	323.9	73.0	101.6	130.2	—	327.2	328.0	12.5	—	—	279	9.5
14	350	584	514.4	1 1/4 (31.8)	20	1 1/8	54.0	425	255.6	76.2	111.1	142.9	—	359.2	360.0	12.5	—	—	311	9.5
16	400	648	571.5	1 3/8 (34.9)	20	1 1/4	57.2	483	406.4	82.6	120.7	146.1	—	410.5	411.0	12.5	—	—	362	9.5
18	450	711	628.6	1 3/8 (34.9)	24	1 1/4	60.3	533	457.2	88.9	130.2	158.8	—	461.8	462.0	12.5	—	—	406	9.5
20	500	775	685.8	1 3/8 (34.9)	24	1 1/4	63.5	587	508.0	95.3	139.7	162.0	—	513.1	514.0	12.5	—	—	457	9.5
24	600	914	812.8	1 5/8 (41.3)	24	1 1/2	69.8	702	609.6	106.4	152.4	168.3	—	616.0	616.0	12.5	—	—	559	9.5

*The use of these sizes should be avoided in new constructions.
NOTE 1. For facing dimensions see table 5.
NOTE 2. See notes following table 14.

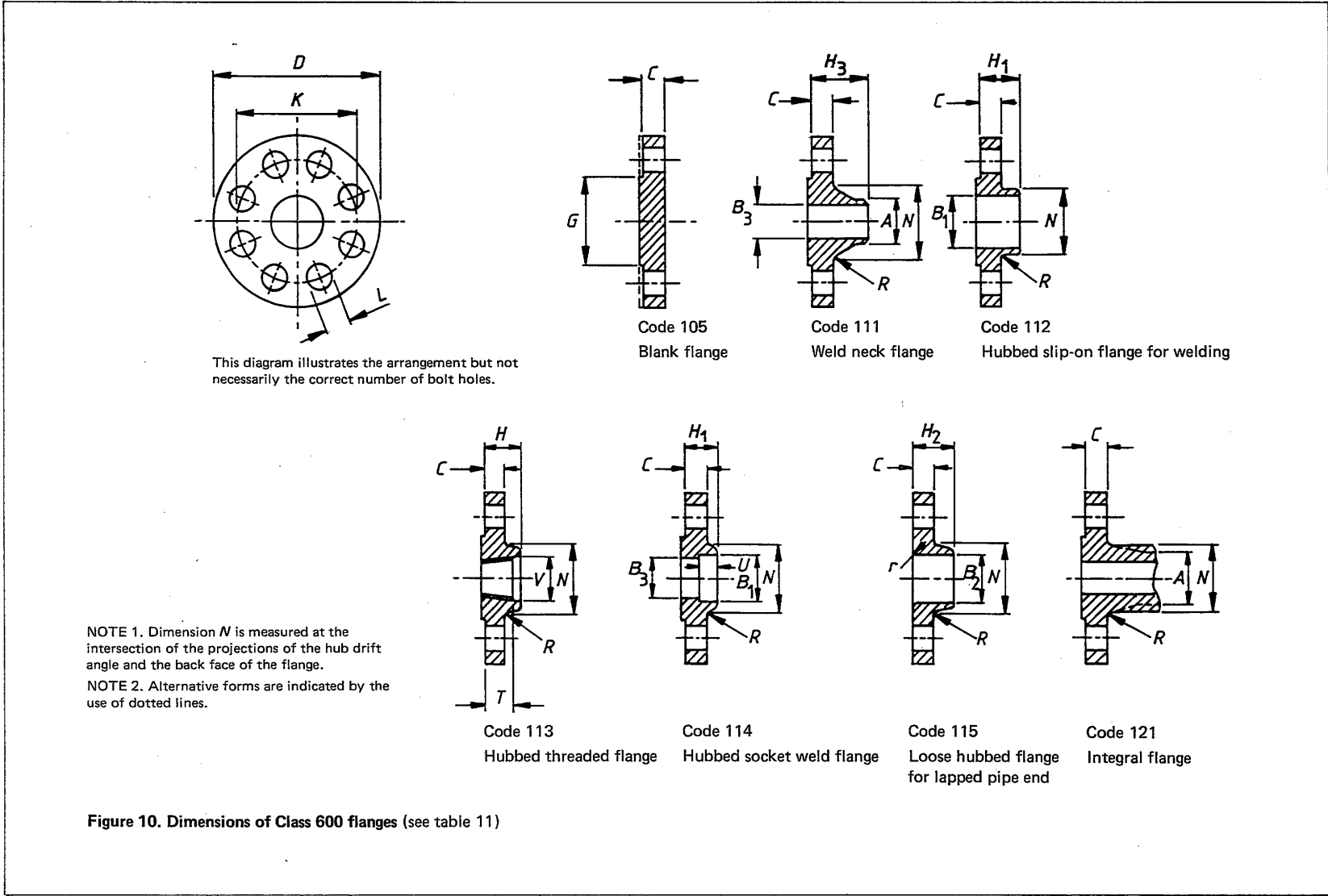


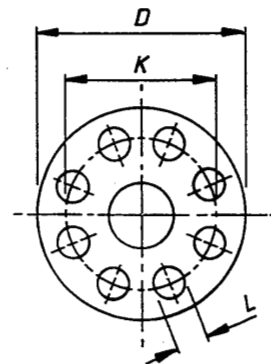
Table 11. Dimensions of Class 600 flanges (see figure 10)

Nominal size	Outside diameter of flange	Mating dimensions				Flange thickness	Hub diameter	Hub diameter at weld end	Length through hub			Minimum thread length of threaded flange	Bore			Corner radius of bore of lapped flange and pipe	Depth of socket	Minimum diameter of counter-bore threaded flange	Shoulder diameter	Hub radius
		Diameter of bolt circle	Diameter of bolt holes	Number of bolts	Nominal diameter of bolts				Threaded; slip-on; socket weld	Lapped	Weld neck		Slip-on; socket weld	Lapped	Weld neck; socket weld					
	D	K	L			C	N	A	H ₁	H ₂	H ₃	T	B ₁	B ₂	B ₃	r	U	V	G	R min.
Codes affected	105, 111, 112, 113, 114, 115, 121					105, 111, 112, 113, 114, 115, 121	111, 112, 113, 114, 115, 121	111, 121	112, 113, 114	115	111	113	112, 114	115	111, 114	115	114	113	105	111, 114, 112, 115, 113, 121
in	DN	mm	mm	in (mm)		in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1/2	15	95	66.7	5/8 (15.9)	4	1/2	14.3	38	21.3	22.2	22.2	52.4	16	22.4	23.0	3.0	9.5	23.5	—	3
3/4	20	117	82.6	3/4 (19.0)	4	5/8	15.9	48	26.7	25.4	25.4	57.2	16	27.7	28.0	3.0	11.0	29.0	—	3
1	25	124	88.9	3/4 (19.0)	4	5/8	17.5	54	33.4	27.0	27.0	61.9	17	34.5	35.0	3.0	12.5	36.0	—	3
*1 1/4	32	133	98.4	3/4 (19.0)	4	5/8	20.6	64	42.2	28.6	28.6	66.8	21	43.2	43.5	5.0	14.5	44.5	—	3
1 1/2	40	156	114.3	7/8 (22.2)	4	3/4	22.2	70	48.3	31.8	31.8	69.9	22	49.5	50.0	6.5	16.0	50.5	—	3
2	50	165	127.0	3/4 (19.0)	8	5/8	25.4	84	60.3	36.5	36.5	73.0	29	62.0	62.5	8.0	17.5	63.5	—	3
*2 1/2	65	190	149.2	7/8 (22.2)	8	3/4	28.6	100	73.0	41.3	41.3	79.4	32	74.7	75.5	8.0	19.0	76.0	38	3
3	80	210	168.3	7/8 (22.2)	8	3/4	31.8	117	88.9	46.0	46.0	82.6	35	90.7	91.5	9.5	20.5	92.0	51	3
4	100	273	215.9	1 (25.4)	8	7/8	38.1	152	114.3	54.0	54.0	101.6	41	116.1	117.0	11.0	—	118.0	76	3
*5	125	330	266.7	1 1/8 (28.6)	8	1	44.4	189	141.3	60.3	60.3	114.3	48	143.8	145.0	11.0	—	145.0	102	6.5
6	150	356	292.1	1 1/8 (28.6)	12	1	47.6	222	168.3	66.8	66.8	117.5	51	170.7	171.0	12.5	—	171.0	127	6.5
8	200	419	349.2	1 1/4 (31.8)	12	1 1/8	55.6	273	219.1	76.2	76.2	133.4	—	221.5	222.0	12.5	—	—	175	6.5
10	250	508	431.8	1 3/8 (34.9)	16	1 1/4	63.5	343	273.0	85.7	111.1	152.4	—	276.4	277.0	12.5	—	—	222	6.5
12	300	559	489.0	1 3/8 (34.9)	20	1 1/4	66.7	400	323.9	92.1	117.5	155.6	—	327.2	328.0	12.5	—	—	273	11
14	350	603	527.0	1 1/2 (38.1)	20	1 3/8	69.8	432	355.6	93.7	127.0	165.1	—	359.2	360.0	12.5	—	—	302	11
16	400	686	603.2	1 5/8 (41.3)	20	1 1/2	76.2	495	406.4	106.4	139.7	177.8	—	410.5	411.0	12.5	—	—	349	11
18	450	743	654.0	1 3/4 (44.4)	20	1 5/8	82.6	546	457.2	117.5	151.4	184.2	—	461.8	462.0	12.5	—	—	394	11
20	500	813	723.9	1 3/4 (44.4)	24	1 5/8	88.9	610	508.0	127.0	165.1	190.5	—	513.1	514.0	12.5	—	—	438	11
24	600	940	838.2	2 (50.8)	24	1 7/8	101.6	718	609.6	139.7	184.2	203.2	—	616.0	616.0	12.5	—	—	533	11

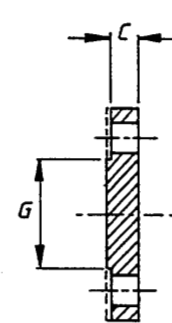
*The use of these sizes should be avoided in new constructions.

NOTE 1. For facing dimensions see table 5.

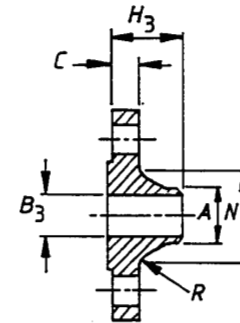
NOTE 2. See notes following table 14.



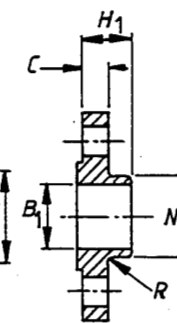
This diagram illustrates the arrangement but not necessarily the correct number of bolt holes.



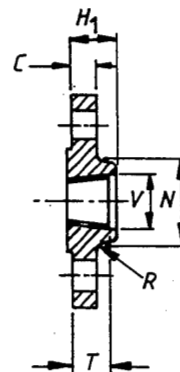
Code 105
Blank flange



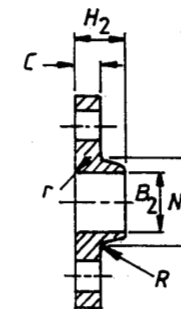
Code 111
Weld neck flange



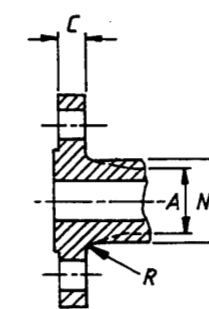
Code 112
Hubbed slip-on flange for welding



Code 113
Hubbed threaded flange



Code 115
Loose hubbed flange
for lapped pipe end



Code 121
Integral flange

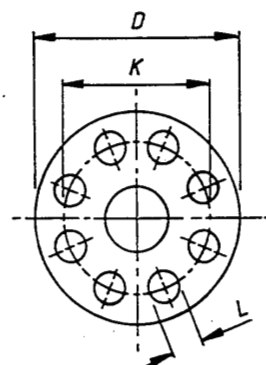
NOTE 1. Dimension N is measured at the intersection of the projections of the hub drift angle and the back face of the flange.

NOTE 2. Alternative forms are indicated by the use of dotted lines.

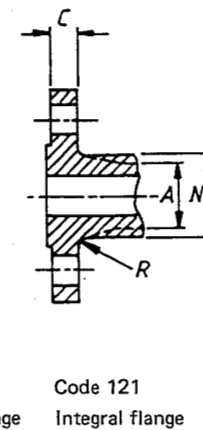
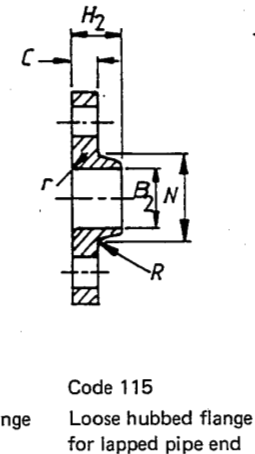
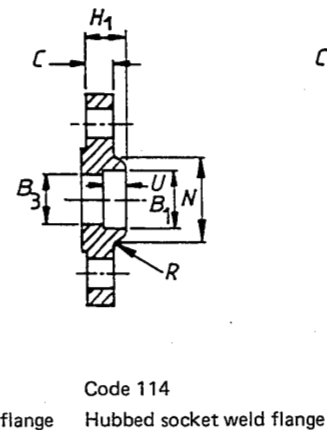
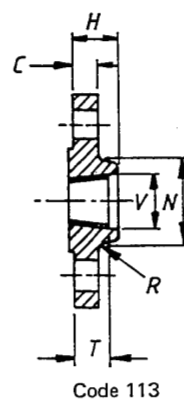
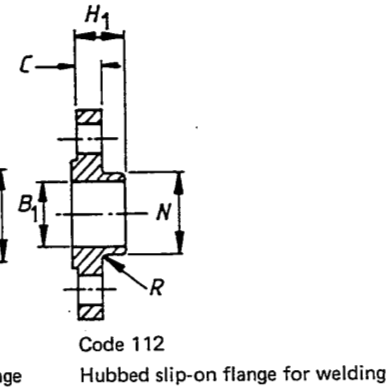
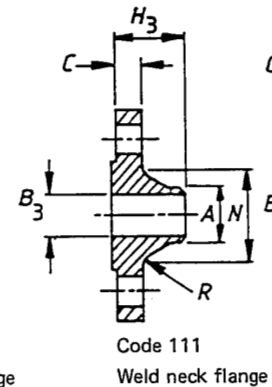
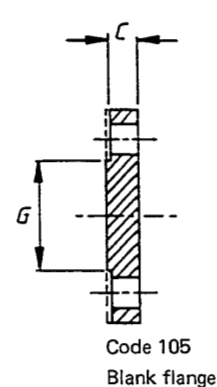
Figure 11. Dimensions of Class 900 flanges (see table 12)

Table 12. Dimensions of Class 900 flanges (see figure 11)

Nominal size	Outside diameter of flange	Mating dimensions				Flange thickness	Hub diameter	Hub diameter at weld end	Length through hub			Minimum thread length of threaded flange	Bore			Corner radius of bore of lapped flange and pipe <i>r</i>	Minimum diameter of counter-bore threaded flange <i>V</i>	Shoulder diameter <i>G</i>	Hub radius <i>R</i> min.	
		Diameter of bolt circle <i>K</i>	Diameter of bolt holes <i>L</i>	Number of bolts	Nominal diameter of bolts				Threaded; slip-on <i>H</i> ₁	Lapped <i>H</i> ₂	Weld neck <i>H</i> ₃		Slip-on <i>B</i> ₁	Lapped <i>B</i> ₂	Weld neck <i>B</i> ₃					
Codes affected	105, 111, 112, 113, 115, 121					105, 111, 112, 113, 115, 121	111, 112, 113, 115, 121	111, 121	112, 113	115	111	113	112	115	111	115	113	105	111, 115, 112, 121, 113	
in	DN	For these sizes Class 1500 flanges are used																		
1/2	15																			
3/4	20																			
1	25																			
*1 1/4	32																			
1 1/2	40																			
2	50																			
*2 1/2	65	mm	mm	in (mm)		in	mm	mm	mm	mm	mm	mm	mm	mm	To be supplied by purchaser	mm	mm	mm	mm	
3	80	241	190.5	1 (25.4)	8	7/8	38.1	127	88.9	54.0	54.0	101.6	41	90.7		91.5	9.5	92	48	3
4	100	292	235.0	1 1/4 (31.8)	8	1 1/8	44.4	159	114.3	69.9	69.9	114.3	48	116.1		117.0	11.0	118	73	5
*5	125	349	279.4	1 3/8 (34.9)	8	1 1/4	50.8	190	141.3	79.4	79.4	127.0	54	143.8		145.0	11.0	145	95	6.5
6	150	381	317.5	1 1/4 (31.8)	12	1 1/8	55.6	235	168.3	85.7	85.7	139.7	57	170.7		171.0	12.5	171	121	6.5
8	200	470	393.7	1 1/2 (38.1)	12	1 3/8	63.5	298	219.1	101.6	114.3	162.0	—	221.5		222.0	12.5	—	165	6.5
10	250	546	469.9	1 1/2 (38.1)	16	1 3/8	69.8	368	273.0	108.0	127.0	184.2	—	276.4		277.0	12.5	—	213	6.5
12	300	610	533.4	1 1/2 (38.1)	20	1 3/8	79.4	419	323.9	117.5	142.9	200.0	—	327.2		328.0	12.5	—	257	9.5
14	350	641	558.8	1 5/8 (41.3)	20	1 1/2	85.7	451	355.6	130.2	155.6	212.8	—	359.2		360.0	12.5	—	286	11
16	400	705	616.0	1 3/4 (44.4)	20	1 5/8	88.9	508	406.4	133.4	165.1	215.9	—	410.5		411.0	12.5	—	381	11
18	450	787	685.8	2 (50.8)	20	1 7/8	101.6	565	457.2	152.4	190.5	228.6	—	461.8		462.0	12.5	—	419	11
20	500	857	749.3	2 1/8 (54.0)	20	2	108.0	622	508.0	158.8	209.6	247.7	—	513.1		514.0	12.5	—	451	11
24	600	1041	901.7	2 5/8 (66.7)	20	2 1/2	139.7	749	609.6	203.2	266.7	292.1	—	616.0	616.0	12.5	—	508	11	
*The use of these sizes should be avoided in new constructions.																				
NOTE 1. For facing dimensions see table 5.																				
NOTE 2. See notes following table 14.																				



This diagram illustrates the arrangement but not necessarily the correct number of bolt holes.



NOTE 1. Dimension N is measured at the intersection of the projections of the hub drift angle and the back face of the flange.
NOTE 2. Alternative forms are indicated by the use of dotted lines.

Figure 12. Dimensions of Class 1500 flanges (see table 13)

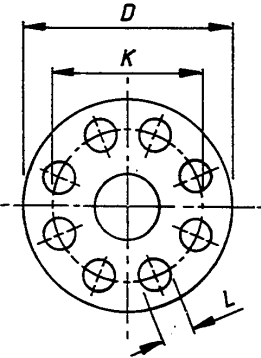
Table 13. Dimensions of Class 1500 flanges (see figure 12)

Nominal size	Outside diameter of flange	Mating dimensions				Flange thickness	Hub diameter	Hub diameter at weld end	Length through hub			Minimum thread length of threaded flange	Bore			Corner radius of bore of lapped flange and pipe	Depth of socket	Minimum diameter of counter-bore threaded flange	Shoulder diameter	Hub radius
		Diameter of bolt circle	Diameter of bolt holes	Number of bolts	Nominal diameter of bolts				Threaded; slip-on; socket weld	Lapped	Weld neck		Slip-on; socket weld	Lapped	Weld neck; socket weld					
	D	K	L			C	N	A	H ₁	H ₂	H ₃	T	B ₁	B ₂	B ₃	r	U	V	G	R min.
Codes affected	105, 111, 112, 113, 114, 115, 121					105, 111, 112, 113, 114, 115, 121	111, 112, 113, 114, 115, 121	111, 121	112, 113, 114	115	111	113	112, 114	115	111, 114	115	114	105	105	111, 114, 112, 115, 113, 121
in	DN	mm	mm	in (mm)		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1/2	15	121	82.6	7/8 (22.2)	4	3/4	22.2	38	21.3	31.8	31.8	60.3	22	22.4	23.0	3.0	9.5	23.5	—	5
3/4	20	130	88.9	7/8 (22.2)	4	3/4	25.4	44	26.7	34.9	34.9	69.9	25	27.7	28.0	3.0	11.0	29.0	—	5
1	25	149	101.6	1 (25.4)	4	7/8	28.6	52	33.4	41.3	41.3	73.0	29	34.5	35.0	3.0	12.5	36.0	—	5
*1 1/4	32	159	111.1	1 (25.4)	4	7/8	28.6	64	42.2	41.3	41.3	73.0	30	43.2	43.5	5.0	14.5	44.5	—	5
1 1/2	40	178	123.8	1 1/8 (28.6)	4	1	31.8	70	48.3	44.5	44.5	82.6	32	49.5	50.0	6.5	16.0	50.5	—	5
2	50	216	165.1	1 (25.4)	8	7/8	38.1	105	60.3	57.2	57.2	101.6	38	62.0	62.5	8.0	17.5	63.5	—	5
*2 1/2	65	244	190.5	1 1/8 (28.6)	8	1	41.3	124	73.0	63.5	63.5	104.8	48	74.7	75.0	8.0	19.0	76.0	32	5
3	80	267	203.2	1 1/4 (31.8)	8	1 1/8	47.6	133	88.9	73.0	73.0	117.5	51	—	91.5	9.5	—	92.0	44	5
4	100	311	241.3	1 3/8 (34.9)	8	1 1/4	54.0	162	114.3	90.5	90.5	123.8	57	—	117.0	11.0	—	118.0	66	5
*5	125	375	292.1	1 5/8 (41.3)	8	1 1/2	73.0	197	141.3	104.8	104.8	155.6	64	—	145.0	11.0	—	145.0	86	6.5
6	150	394	317.5	1 1/2 (38.1)	12	1 3/8	82.6	229	168.3	119.1	119.1	171.5	70	—	171.0	12.5	—	171.0	111	6.5
8	200	483	393.7	1 3/4 (44.4)	12	1 5/8	92.1	292	219.1	142.9	142.9	212.7	—	—	222.0	12.5	—	—	152	6.5
10	250	584	482.6	2 (50.8)	12	1 7/8	108.0	368	273.0	158.8	177.8	254.0	—	—	277.0	12.5	—	—	197	9.5
12	300	673	571.5	2 1/8 (54.0)	16	2	123.8	451	323.9	181.0	219.1	282.6	—	—	328.0	12.5	—	—	238	11
14	350	749	635.0	2 3/8 (60.3)	16	2 1/4	133.4	495	355.6	—	241.3	298.5	—	—	360.0	12.5	—	—	263	11
16	400	826	704.8	2 5/8 (66.7)	16	2 1/2	146.1	552	406.4	—	260.4	311.2	—	—	411.0	12.5	—	—	305	11
18	450	914	774.7	2 7/8 (73.0)	16	2 3/4	161.9	597	457.2	—	276.2	327.0	—	—	462.0	12.5	—	—	346	11
20	500	984	831.8	3 1/8 (79.4)	16	3	178.0	641	508.0	—	292.1	355.6	—	—	514.0	12.5	—	—	390	11
24	600	1168	990.6	3 5/8 (92.0)	16	3 1/2	203.0	762	609.6	—	330.2	406.4	—	—	616.0	12.5	—	—	473	11

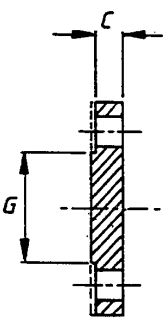
*The use of these sizes should be avoided in new constructions.

NOTE 1. For facing dimensions see table 5.

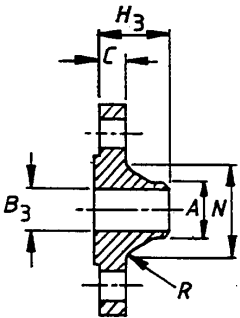
NOTE 2. See notes following table 14.



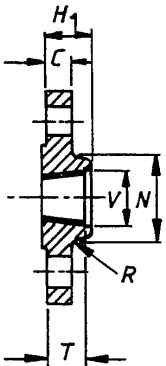
This diagram illustrates the arrangement but not necessarily the correct number of bolt holes.



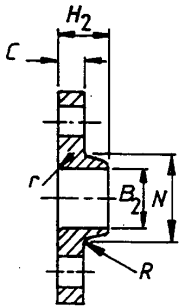
Code 105
Blank flange



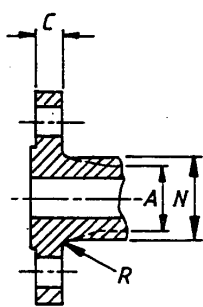
Code 111
Weld neck flange



Code 113
Hubbed threaded flange



Code 115
Loose hubbed flange
for lapped pipe end



Code 121
Integral flange

NOTE 1. Dimension N is measured at the intersection of the projections of the hub drift angle and the back face of the flange.
NOTE 2. Alternative forms are indicated by the use of dotted lines.

Figure 13. Dimensions of Class 2500 flanges (see table 14)

Table 14. Dimensions of Class 2500 flanges (see figure 13)

Nominal size	Outside diameter of flange	Mating dimensions				Flange thickness	Hub diameter	Hub diameter at weld end	Length through hub			Minimum thread length of threaded flange	Bore		Corner radius of bore of lapped flange and pipe	Minimum diameter of counter-bore threaded flange	Shoulder diameter	Hub radius
		Diameter of bolt circle	Diameter of bolt holes	Number of bolts	Nominal diameter of bolts				Threaded	Lapped	Weld neck		Lapped	Weld neck				
	D	K	L			C	N	A	H ₁	H ₂	H ₃	T	B ₂	B ₃	r	V	G	R min.
Codes affected	105, 111, 113, 115, 121					105, 111, 113, 115, 121	111, 113, 115, 121	111, 121	113	115	111	113	115	111	115	113	105	111, 115, 113, 121
in DN	mm	mm	in (mm)		in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1/2 15	133	88.9	7/8 (22.2)	4	3/4	30.2	43	21.3	39.7	39.7	73.0	29	23.0		3.0	23.5	—	5
3/4 20	140	95.2	7/8 (22.2)	4	3/4	31.7	51	26.7	42.9	42.9	79.4	32	28.0		3.0	29.0	—	5
1 25	159	107.9	1 (25.4)	4	7/8	34.9	57	33.4	47.6	47.6	88.9	35	35.0		3.0	35.0	—	5
*1 1/4 32	184	130.2	1 1/8 (28.6)	4	1	38.1	73	42.2	52.4	52.4	95.3	38	43.5		5.0	44.5	—	5
1 1/2 40	203	146.0	1 1/4 (31.8)	4	1 1/8	44.4	79	48.3	60.3	60.3	111.1	44	50.0		6.5	50.5	—	9.5
2 50	235	171.4	1 1/8 (28.6)	8	1	50.8	95	60.3	69.9	69.9	127.0	51	62.5		8.0	63.5	—	9.5
*2 1/2 65	267	196.8	1 1/4 (31.8)	8	1 1/8	57.1	114	73.0	79.4	79.4	142.9	57	75.5		8.0	76.0	22	9.5
3 80	305	228.6	1 3/8 (34.9)	8	1 1/4	66.7	133	88.9	92.1	92.1	168.3	64	91.5		9.5	92.0	32	9.5
4 100	356	273.0	1 5/8 (41.3)	8	1 1/2	76.2	165	114.3	108.0	108.0	190.5	70	117.0		11.0	118.0	48	9.5
*5 125	419	323.8	1 7/8 (47.6)	8	1 3/4	92.1	203	141.3	130.2	130.2	228.6	76	145.0		11.0	145.0	67	9.5
6 150	483	368.3	2 1/8 (54.0)	8	2	108.0	235	168.3	152.4	152.4	273.1	83	171.0		12.5	171.0	86	15.5
8 200	552	438.1	2 1/8 (54.0)	12	2	127.0	305	219.1	—	177.8	317.5	—	222.0		12.5	—	96	15.5
10 250	673	539.7	2 5/8 (66.7)	12	2 1/2	165.1	375	273.0	—	228.6	419.1	—	277.0		12.5	—	159	15.5
12 300	762	619.1	2 7/8 (73.0)	12	2 3/4	184.1	441	323.9	—	254.0	463.6	—	328.0		12.5	—	193	15.5

*The use of these sizes should be avoided in new constructions.

NOTE 1. For facing dimensions see table 5.

NOTE 2. See notes following this table 14.

Notes to flange dimension tables 9 to 14

NOTE 1. For tolerances see clause 10 and table 15.

NOTE 2. For facings see figures 4, 5 and 6, tables 5 and 6 and clause 8.

NOTE 3. For spot facing see clause 9.

NOTE 4. For reducing threaded, slip-on and weld neck flanges see 7.5.

NOTE 5. For threads in threaded flanges see 7.3.

NOTE 6. When Class 150 and Class 300 flanges are required with flat face, either the full thickness or thickness with raised face removed may be supplied. Users are reminded that removing the raised face will mean that the thickness and length through the hub will no longer comply with this Section of BS 1560 (see 8.4).

NOTE 7. The bore sizes of integral (code 121) flanges are usually equal to the nominal size of the pipe, valve or fitting to which they form a part and the actual bore sizes are usually given in the appropriate standard(s) for the pipe, valve or fitting.

Table 15. Tolerances

Dimension	Flange code	Tolerance	Size
Hub diameter at weld end <i>A</i>	111, 121	mm +2.4 -0.8	in ≤ 5
		+4.0 -0.8	> 5
Bore diameter <i>B</i> ₁ , <i>B</i> ₂	101, 112, 114, 115	+0.8 -0	≤ 10
		+1.6 -0	> 10
Bore diameter <i>B</i> ₃	111, 114	±0.8	≤ 10
		±1.6	> 10 ≤ 16
		+3.2 -1.6	> 16
Length through hub <i>H</i> ₁ , <i>H</i> ₂ , <i>H</i> ₃	111, 112, 113, 114, 115	±1.6	≤ 10
		±3.2	> 10
Flange thickness <i>C</i>	All codes	+3.2 -0	≤ 18
		+4.8 -0	> 18
Outside diameter of raised face <i>O</i>	All codes 1.6 mm raised face	±0.8	All sizes
	6.4 mm raised face	±0.4	
Facing dimensions <i>M</i> , <i>Q</i> , <i>W</i> , <i>Y</i> and <i>Z</i>	All codes (facing types C, D, E and F)	±0.4	All sizes
Ring-joint depth <i>E</i>	All codes (facing type J)	+0.4 -0	All sizes
Ring-joint width <i>F</i>		±0.2	
Ring-joint pitch <i>P</i>		±0.13	
23 ° angle		± 1/2 °	
Diameter of bolt circle <i>K</i>	All codes	±1.6	All sizes
Centre-to-centre of adjacent bolt holes	All codes	±0.8	All sizes
Eccentricity of machined facing diameters	All codes	0.8	≤ 2 1/2
		1.6	> 2 1/2
Parallelism between bolting bearing surfaces and flange jointing face	All codes	1 °	All sizes

Table 16. Class 150: pressure/temperature ratings																		
Temperature			Material groups															
°F		°C	1.1	1.2	1.3	1.4	1.5	1.9	1.10	1.13	1.14	2.1	2.2	2.3	2.4	2.5	2.6	2.7
			Maximum permissible working pressure															
Up to		Up to	bar*	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar
100		38	19.7	20.0	18.3	16.2	18.3	20.0	20.0	20.0	20.0	19.0	19.0	15.9	19.0	19.0	17.9	17.9
	122	50	19.3	19.5	18.0	15.9	18.2	19.5	19.5	19.5	19.5	18.4	18.4	15.3	18.4	18.5	17.5	17.5
200		93	17.9	17.9	17.2	14.8	17.9	17.9	17.9	17.9	17.9	16.2	16.5	13.4	16.2	16.9	15.9	15.9
	212	100	17.7	17.7	17.1	14.8	17.7	17.7	17.7	17.7	17.7	16.0	16.3	13.3	16.0	16.7	15.8	15.8
300		149	15.9	15.9	15.9	14.5	15.9	15.9	15.9	15.9	15.9	14.1	14.8	12.1	14.5	15.5	15.2	15.2
	302	150	15.8	15.8	15.8	14.5	15.8	15.8	15.8	15.8	15.8	14.1	14.8	12.0	14.5	15.5	15.1	15.1
	392	200	14.0	14.0	14.0	13.8	14.0	14.0	14.0	14.0	14.0	12.5	13.6	11.1	13.2	13.9	13.9	13.9
400		204	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	12.4	13.4	11.0	13.1	13.8	13.8	13.8
	482	250	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	11.8	12.0	10.2	12.0	12.1	12.1	12.1
500		260	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	10.0	11.7	11.7	11.7	11.7
	572	300	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	9.7	10.2	10.2	10.2	10.2
600		316	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
650		343	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6
	662	350	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
700		371	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
	707	375	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
750		399	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
	752	400	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
	797	425	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
800		427	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
	842	450	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
850		454	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
	887	475	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	—	3.7	3.7	3.7	3.7
900		482	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	—	3.4	3.4	3.4	3.4
	932	500	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	—	2.8	2.8	2.8	2.8
950		510	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	—	2.4	2.4	2.4	2.4
	977	525	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	—	1.8	1.8	1.8	1.8
1000		538	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	—	1.4	1.4	1.4	1.4

*1 bar = 10⁵ N/m² = 10⁵ Pa.

NOTE 1. For limitations of temperature for individual materials see notes to table 3.

NOTE 2. Pressures and temperatures shown in bold type are conversions from ratings given in ANSI B16.5-1981; intermediate values shown in lighter type have been obtained by linear interpolation. For other intermediate values it is recommended that they are obtained by linear interpolation using the original ANSI B16.5 figures shown in bold type.

NOTE 3. Temperature conversions from degrees fahrenheit to degrees celsius have been rounded to the nearest whole degree; pressure conversions from lbf/in² to bar have used a conversion factor from BS 350 : Part 1 of 1 lbf/in² = 0.0689476 bar and have been rounded to the nearest 0.1 bar.

Table 17. Class 300: pressure/temperature ratings

Temperature			Material groups															
°F		°C	1.1	1.2	1.3	1.4	1.5	1.9	1.10	1.13	1.14	2.1	2.2	2.3	2.4	2.5	2.6	2.7
Maximum permissible working pressure																		
Up to		Up to	bar*	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar
100		38	51.0	51.7	47.9	42.7	47.9	51.7	51.7	51.7	51.7	49.6	49.6	41.4	49.6	49.6	46.2	46.2
	122		50.0	51.7	47.3	41.8	47.7	51.1	51.2	51.7	51.7	47.8	48.1	39.9	48.0	48.4	45.2	45.2
200		93	46.5	51.7	45.2	38.6	46.9	49.0	49.3	51.7	51.7	41.4	42.7	34.8	42.1	43.8	41.7	41.7
	212		46.4	51.5	45.0	38.5	46.7	48.7	49.0	51.5	51.5	40.8	42.3	34.4	41.5	43.4	41.4	41.4
300		149	45.2	50.3	44.1	44.8	45.2	46.5	46.5	50.3	50.3	36.5	38.6	31.4	37.6	40.7	39.3	39.3
	302		45.1	50.3	44.1	37.9	45.1	46.5	46.5	50.3	50.3	36.5	38.5	31.3	37.5	40.6	39.3	39.3
	392		43.9	48.7	42.9	36.7	44.2	45.6	45.0	48.7	48.7	32.7	35.8	28.8	34.4	38.5	37.1	37.1
400		204	43.8	48.6	42.7	36.5	44.1	45.5	44.8	48.6	48.6	32.4	35.5	28.6	34.1	38.3	36.9	36.9
	482		41.8	46.3	40.8	34.8	43.0	44.4	44.3	46.3	46.3	30.4	33.5	26.6	32.2	36.3	35.2	35.2
500		260	41.4	45.9	40.3	34.5	42.7	44.1	44.1	45.9	45.9	30.0	33.1	26.2	31.7	35.9	34.8	34.8
	572		38.9	42.9	37.9	32.2	42.0	42.4	42.4	42.9	42.9	29.0	31.6	25.2	30.5	34.4	33.6	33.6
600		316	37.9	41.7	36.9	31.4	41.7	41.7	41.7	41.7	41.7	28.6	31.0	24.8	30.0	33.8	33.1	33.1
650		343	36.9	40.7	36.2	31.0	40.7	40.7	40.7	40.7	40.7	28.3	30.7	24.1	29.6	33.1	32.1	32.1
	662		36.9	40.3	36.1	31.0	40.3	40.3	40.3	40.3	40.3	28.2	30.4	24.0	29.5	32.9	31.9	31.9
700		371	36.9	39.3	35.9	31.0	39.3	39.3	39.3	39.3	39.3	27.9	29.6	23.8	29.0	32.4	31.4	31.4
	707		36.6	38.7	35.4	31.0	38.9	38.9	38.9	38.9	38.9	27.9	29.6	23.7	28.9	32.3	31.3	31.3
750		399	34.8	34.8	32.8	30.7	36.5	36.5	36.5	36.5	36.5	27.6	29.3	23.1	28.6	31.7	30.7	30.7
	752		34.6	34.6	32.5	30.5	36.5	36.5	36.5	36.5	36.5	27.6	29.3	23.1	28.6	31.7	30.7	30.7
	797		28.7	28.7	27.2	25.8	35.2	35.2	35.2	34.6	35.2	27.3	28.7	22.8	28.6	31.4	30.0	30.0
800		427	28.3	28.3	26.9	25.5	35.2	35.2	35.2	34.5	35.2	27.2	28.6	22.8	28.6	31.4	30.0	30.0
	842		20.2	20.2	19.9	19.7	33.7	33.7	33.7	31.0	33.7	26.9	28.0	22.2	28.3	30.8	29.4	29.4
850		454	18.6	18.6	18.6	18.6	33.4	33.4	33.4	30.3	33.4	26.9	27.9	22.1	28.3	30.7	29.3	29.3
	887		13.5	13.5	13.5	13.5	31.7	31.7	31.7	26.0	31.7	26.6	27.4	—	28.0	29.9	28.8	28.8
900		482	11.7	11.7	11.7	11.7	31.0	31.0	31.0	24.5	31.0	26.5	27.2	—	27.9	29.6	28.6	28.6
	932		8.9	8.9	8.9	8.9	23.5	27.9	27.9	20.3	27.5	26.1	26.8	—	27.0	27.7	27.3	27.3
950		510	7.2	7.2	7.2	7.2	19.3	26.2	26.2	17.9	25.5	25.9	26.5	—	26.5	26.5	26.5	26.5
	977		5.2	5.2	5.2	5.2	15.0	20.4	20.8	15.3	22.5	24.0	25.8	—	25.4	25.8	24.7	25.2
1000		538	3.4	3.4	3.4	3.4	11.4	15.5	18.6	13.1	20.0	22.4	25.2	—	24.5	25.2	23.1	24.1
	1022		—	—	—	—	—	12.9	15.7	11.6	17.0	22.0	25.0	—	24.2	25.0	21.7	23.7
1050		566	—	—	—	—	—	9.7	13.8	9.7	13.1	21.4	24.8	—	23.8	24.8	20.0	23.1
	1067		—	—	—	—	—	8.6	9.5	8.8	11.3	20.2	24.0	—	22.7	24.0	18.5	22.0
1100		593	—	—	—	—	—	6.6	7.9	7.2	7.9	17.9	22.4	—	20.7	22.4	15.5	20.0
	1112		—	—	—	—	—	5.8	7.8	6.7	7.3	16.9	21.6	—	19.6	21.6	14.6	19.3
1150		621	—	—	—	—	—	3.4	7.2	4.8	5.2	13.4	19.0	—	16.2	19.0	11.7	16.9
	1157		—	—	—	—	—	3.3	6.8	4.6	4.9	13.1	18.3	—	15.7	17.9	11.3	16.5
1200		649	—	—	—	—	—	2.4	3.8	3.1	3.4	10.7	14.1	—	12.4	11.7	9.0	14.1
	1202		—	—	—	—	—	—	—	—	—	10.6	14.1	—	12.3	11.6	8.2	14.0
	1247		—	—	—	—	—	—	—	—	—	7.8	12.5	—	9.8	8.8	7.0	11.2
1250		677	—	—	—	—	—	—	—	—	—	7.6	12.4	—	9.7	8.6	6.9	11.0
	1292		—	—	—	—	—	—	—	—	—	6.1	10.1	—	7.6	6.9	5.7	8.7
1300		704	—	—	—	—	—	—	—	—	—	5.9	9.7	—	7.2	6.6	5.5	8.3
	1337		—	—	—	—	—	—	—	—	—	4.6	7.9	—	6.0	5.3	4.5	6.2
1350		732	—	—	—	—	—	—	—	—	—	4.1	7.2	—	5.5	4.8	4.1	5.5
	1382		—	—	—	—	—	—	—	—	—	3.7	5.9	—	4.6	3.9	3.5	4.4
1400		760	—	—	—	—	—	—	—	—	—	3.4	5.2	—	4.1	3.4	3.1	3.8
	1427		—	—	—	—	—	—	—	—	—	2.9	4.6	—	3.8	3.1	2.5	3.2
1450		788	—	—	—	—	—	—	—	—	—	2.4	4.1	—	3.4	2.8	2.1	2.8
	1472		—	—	—	—	—	—	—	—	—	2.1	3.5	—	3.1	2.6	1.9	2.3
1500		816	—	—	—	—	—	—	—	—	—	1.7	2.8	—	2.8	2.4	1.7	1.7

*1 bar = 10⁵ N/m² = 10⁵ Pa.

NOTE 1. For limitations of temperature for individual materials see notes to table 3.

NOTE 2. Pressures and temperatures shown in bold type are conversions from ratings given in ANSI B16.5-1981; intermediate values shown in lighter type have been obtained by linear interpolation. For other intermediate values it is recommended that they are obtained by linear interpolation using the original ANSI B16.5 figures shown in bold type.

NOTE 3. Temperature conversions from degrees fahrenheit to degrees celsius have been rounded to the nearest whole degree; pressure conversions from lbf/in² to bar have used a conversion factor from BS 350 : Part 1 of 1 lbf/in² = 0.0689476 bar and have been rounded to the nearest 0.1 bar.

Table 18. Class 600: pressure/temperature ratings

Temperature				Material groups															
°F		°C		1.1	1.2	1.3	1.4	1.5	1.9	1.10	1.13	1.14	2.1	2.2	2.3	2.4	2.5	2.6	2.7
Maximum permissible working pressure																			
Up to		Up to		bar*	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar
100		38		102.0	103.4	95.8	85.2	95.8	103.4	103.4	103.4	103.4	99.3	99.3	82.7	99.3	99.3	92.7	92.7
	122		50	100.1	103.4	94.7	83.5	95.4	102.3	102.4	103.4	103.4	95.6	96.3	79.2	95.9	96.7	90.7	90.7
200		93		93.1	103.4	90.7	77.6	93.8	98.3	98.6	103.4	103.4	82.7	85.5	70.0	84.1	87.6	83.4	83.4
	212		100	92.8	103.0	90.3	77.3	93.3	97.6	98.0	102.4	102.4	81.5	84.5	69.1	83.0	86.8	82.8	82.8
300		149		90.7	100.3	87.9	75.5	90.0	92.7	93.4	100.3	100.3	72.7	77.2	62.7	75.2	81.0	78.6	78.6
	302		150	90.6	100.3	87.9	75.4	89.9	92.7	93.3	100.3	100.3	72.6	77.1	62.6	75.0	80.9	78.5	78.5
	392		200	87.8	97.5	85.4	73.3	88.4	90.8	89.6	97.5	97.5	65.4	71.5	57.4	68.8	76.9	73.8	73.8
400		204		87.6	97.2	85.2	73.1	88.3	90.7	89.3	97.2	97.2	64.8	71.0	56.9	68.3	76.5	73.4	73.4
	482		250	83.6	92.7	81.2	69.4	86.3	89.0	88.4	92.7	92.7	61.1	66.8	53.5	64.0	72.3	70.3	70.3
500		260		82.7	91.7	80.3	68.6	85.8	88.6	88.3	91.7	91.7	60.3	65.8	52.7	63.1	71.4	69.6	69.6
	572		300	77.5	85.6	75.4	64.6	84.1	84.9	84.8	85.7	85.7	58.1	63.4	50.5	61.1	68.9	66.9	66.9
600		316		75.5	83.4	73.4	63.1	83.4	83.4	83.4	83.4	83.4	57.2	62.4	49.6	60.3	67.9	65.8	65.8
650		343		74.1	81.0	72.1	61.7	81.0	81.0	81.0	81.0	81.0	56.2	61.4	48.3	59.0	66.2	64.1	64.1
	662		350	74.0	80.4	71.9	61.7	80.4	80.4	80.4	80.4	80.4	56.0	60.9	48.0	58.7	65.8	63.8	63.8
700		371		73.4	78.3	71.4	61.7	78.3	78.3	78.3	78.3	78.3	55.5	59.6	47.2	57.9	64.5	62.7	62.7
	707		375	72.9	77.0	70.5	61.6	77.6	77.6	77.6	77.6	77.6	55.4	59.4	47.1	57.8	64.3	62.6	62.6
750		399		69.6	69.6	65.2	61.0	73.4	73.4	73.4	73.4	73.4	54.8	58.3	46.2	57.2	63.4	61.7	61.7
	752		400	69.1	69.1	64.7	60.6	73.3	73.3	73.3	73.2	73.3	54.8	58.2	46.2	57.2	63.4	61.6	61.6
	797		425	57.6	57.6	54.5	51.6	70.2	70.2	70.2	68.9	70.2	54.5	57.3	45.5	56.9	62.8	60.1	60.1
800		427		56.9	56.9	53.8	51.0	70.0	70.0	70.0	68.6	70.0	54.5	57.2	45.5	56.9	62.7	60.0	60.0
	842		450	40.1	40.1	39.6	39.1	67.8	67.8	67.8	61.9	67.8	53.9	56.1	44.6	56.3	61.6	58.8	58.8
850		454		36.9	36.9	36.9	36.9	67.2	67.2	67.2	60.7	67.2	53.8	55.8	44.5	56.2	61.4	58.6	58.6
	887		475	27.2	27.2	27.2	27.2	63.4	63.4	63.4	51.7	63.4	53.3	54.8	—	55.9	60.1	57.6	57.6
900		482		23.8	23.8	23.8	23.8	62.1	62.1	62.1	48.6	62.1	53.1	54.5	—	55.8	59.6	57.2	57.2
	932		500	17.6	17.6	17.6	17.6	47.0	55.7	55.7	40.4	55.0	52.2	53.8	—	54.3	55.7	54.8	54.8
950		510		14.1	14.1	14.1	14.1	38.6	52.1	52.1	35.9	51.0	51.7	53.4	—	53.4	53.4	53.4	53.4
	977		525	10.4	10.4	10.4	10.4	30.0	40.5	43.9	30.8	45.3	47.8	51.6	—	51.2	51.6	49.5	50.6
1000		538		7.2	7.2	7.2	7.2	22.8	30.7	36.9	26.5	40.3	44.5	50.0	—	49.3	50.0	46.2	48.3
	1022		550	—	—	—	—	—	25.5	32.8	23.4	34.1	43.7	49.8	—	48.7	49.8	43.6	47.2
1050		566		—	—	—	—	—	19.0	27.6	19.3	26.2	42.7	49.6	—	47.9	49.6	40.3	45.9
	1067		575	—	—	—	—	—	17.0	23.5	17.5	22.6	40.3	47.9	—	45.8	47.9	37.1	44.0
1100		593		—	—	—	—	—	13.1	15.5	14.1	15.5	35.5	44.5	—	41.7	44.5	30.7	40.3
	1112		600	—	—	—	—	—	11.7	15.2	13.1	14.3	33.4	42.9	—	39.6	42.9	29.0	38.8
1150		621		—	—	—	—	—	7.2	14.1	9.7	10.3	26.9	37.9	—	32.8	37.9	23.8	34.1
	1157		625	—	—	—	—	—	6.9	13.2	9.2	9.9	26.1	36.6	—	31.7	35.9	23.0	33.3
1200		649		—	—	—	—	—	4.8	7.6	6.2	7.2	21.4	28.3	—	25.2	23.8	17.9	28.3
	1202		650	—	—	—	—	—	—	—	—	—	21.1	28.1	—	24.9	23.5	17.8	28.0
	1247		675	—	—	—	—	—	—	—	—	—	15.5	25.4	—	19.7	17.3	14.0	22.8
1250		677		—	—	—	—	—	—	—	—	—	15.2	25.2	—	19.3	16.9	13.8	22.4
	1292		700	—	—	—	—	—	—	—	—	—	12.0	20.0	—	15.3	13.4	11.5	17.5
1300		704		—	—	—	—	—	—	—	—	—	11.4	19.0	—	14.5	12.8	11.0	16.5
	1337		725	—	—	—	—	—	—	—	—	—	9.3	15.4	—	12.2	10.2	8.7	12.5
1350		732		—	—	—	—	—	—	—	—	—	8.6	14.1	—	11.4	9.3	7.9	11.0
	1382		750	—	—	—	—	—	—	—	—	—	7.1	11.7	—	9.6	8.0	6.8	8.8
1400		760		—	—	—	—	—	—	—	—	—	6.2	10.3	—	8.6	7.2	6.2	7.6
	1427		775	—	—	—	—	—	—	—	—	—	5.5	9.0	—	7.5	6.3	5.1	6.3
1450		788		—	—	—	—	—	—	—	—	—	4.8	7.9	—	6.6	5.5	4.1	5.2
	1472		800	—	—	—	—	—	—	—	—	—	4.2	7.0	—	5.9	5.2	3.8	4.4
1500		816		—	—	—	—	—	—	—	—	—	3.4	5.9	—	5.2	4.8	3.4	3.4

*1 bar = $10^5 \text{ N/m}^2 = 10^5 \text{ Pa}$.

NOTE 1. For limitations of temperature for individual materials see notes to table 3.

NOTE 2. Pressures and temperatures shown in bold type are conversions from ratings given in ANSI B16.5-1981; intermediate values shown in lighter type have been obtained by linear interpolation. For other intermediate values it is recommended that they are obtained by linear interpolation using the original ANSI B16.5 figures shown in bold type.

NOTE 3. Temperature conversions from degrees fahrenheit to degrees celsius have been rounded to the nearest whole degree; pressure conversions from lbf/in^2 to have used a conversion factor from BS 350 : Part 1 of $1 \text{ lbf/in}^2 = 0.0689476 \text{ bar}$ and have been rounded to the nearest 0.1 bar.

Table 19. Class 900: pressure/temperature ratings

Temperature				Material groups															
°F		°C		1.1	1.2	1.3	1.4	1.5	1.9	1.10	1.13	1.14	2.1	2.2	2.3	2.4	2.5	2.6	2.7
				Maximum permissible working pressure															
Up to		Up to		bar*	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar
100		38		153.1	155.1	143.8	127.6	143.8	155.1	155.1	155.1	155.1	148.9	148.9	124.1	148.9	148.9	138.9	138.9
	122		50	150.1	155.1	142.0	125.1	143.0	153.4	153.6	155.1	155.1	143.5	144.4	119.9	143.9	145.1	135.9	135.9
200		93		139.6	155.1	135.8	116.2	140.3	147.2	148.2	155.1	155.1	124.1	128.2	104.8	126.2	131.7	125.1	125.1
	212		100	139.2	154.6	135.4	115.8	139.6	146.3	147.2	154.6	154.6	122.3	128.0	103.5	124.6	130.5	124.2	124.2
300		149		135.8	150.7	132.0	113.1	134.8	139.3	140.0	150.7	150.7	109.3	115.8	93.8	112.7	121.7	117.6	117.6
	302		150	135.7	150.6	131.9	113.0	134.7	139.2	139.8	150.6	150.6	109.0	115.6	93.6	112.5	121.6	117.4	117.4
	392		200	131.4	146.2	127.9	109.6	132.6	136.4	134.6	146.2	146.2	98.2	107.0	86.2	103.2	115.3	110.9	110.9
400		204		131.0	145.8	127.6	109.3	132.4	136.2	134.1	145.8	145.8	97.2	106.2	85.5	102.4	114.8	110.3	110.3
	482		250	125.1	139.0	121.6	104.2	129.3	133.3	132.7	139.0	139.0	91.6	100.2	80.1	96.2	108.6	105.2	105.2
500		260		123.8	137.6	120.3	103.1	128.6	132.7	132.4	137.6	137.6	90.3	98.9	78.9	94.8	107.2	104.1	104.1
	572		300	116.1	128.6	113.1	96.9	126.1	127.3	127.2	128.6	128.6	87.1	95.0	75.7	91.6	103.2	100.4	100.4
600		316		113.1	125.1	110.3	94.5	125.1	125.1	125.1	125.1	125.1	85.8	93.4	74.5	90.3	101.7	98.9	98.9
650		343		111.0	121.7	108.2	92.7	121.7	121.7	121.7	121.7	121.7	84.5	91.7	72.4	88.3	99.3	96.2	96.2
	662		350	110.8	120.7	108.0	92.7	120.7	120.7	120.7	120.7	120.7	84.2	91.1	72.1	87.9	98.7	95.8	95.8
700		371		110.3	117.6	107.2	92.7	117.6	117.6	117.6	117.6	117.6	83.4	89.3	71.0	86.9	96.9	94.5	94.5
	707		375	109.4	115.7	105.9	92.5	116.5	116.5	116.5	116.5	116.5	83.3	89.0	70.8	86.7	96.7	94.2	94.2
750		399		104.1	104.1	97.9	91.4	110.0	110.0	110.0	110.0	110.0	82.4	87.6	69.6	85.8	95.5	92.4	92.4
	752		400	103.4	103.4	97.2	90.8	109.8	109.8	109.8	109.7	109.8	82.4	87.5	69.6	85.8	95.5	92.3	92.3
	797		425	86.3	86.3	82.0	77.4	105.4	105.4	105.4	103.2	105.4	81.4	85.9	68.0	85.5	94.5	90.1	90.1
800		427		85.2	85.2	81.0	76.5	105.1	105.1	105.1	102.7	105.1	81.4	85.8	67.9	85.5	94.5	90.0	90.0
	842		450	60.2	60.2	59.6	58.9	101.4	101.4	101.4	92.6	101.4	80.5	84.1	66.8	84.6	92.1	88.2	88.2
850		454		55.5	55.5	55.5	55.5	100.7	100.7	100.7	90.7	100.7	80.3	83.8	66.5	84.5	91.7	87.9	87.9
	887		475	40.7	40.7	40.7	40.7	95.1	95.1	95.1	77.7	95.1	79.6	82.0	—	84.0	89.9	86.4	86.4
900		482		35.5	35.5	35.5	35.5	93.1	93.1	93.1	73.1	93.1	79.3	81.4	—	83.8	89.3	85.8	85.8
	932		500	26.5	26.5	26.5	26.5	70.8	90.4	90.4	60.7	82.5	78.2	80.5	—	81.3	83.3	82.1	82.1
950		510		21.4	21.4	21.4	21.4	58.3	77.9	77.9	53.8	76.5	77.6	80.0	—	80.0	80.0	80.0	80.0
	977		525	15.6	15.6	15.6	15.6	45.2	60.8	65.8	46.1	67.8	71.6	77.4	—	76.6	77.4	74.4	75.9
1000		538		10.7	10.7	10.7	10.7	34.1	46.2	55.5	39.6	60.3	66.5	75.2	—	73.8	75.2	69.6	72.4
	1022		550	—	—	—	—	—	38.3	49.1	34.9	50.9	65.3	74.8	—	72.9	74.8	65.5	70.9
1050		566		—	—	—	—	—	28.3	41.0	29.0	39.0	63.8	74.5	—	71.7	74.5	60.3	68.9
	1067		575	—	—	—	—	—	25.5	35.0	26.4	33.7	60.1	71.8	—	68.5	71.8	55.5	66.0
1100		593		—	—	—	—	—	20.0	23.4	21.4	23.4	53.1	66.5	—	62.4	66.5	46.2	60.3
	1112		600	—	—	—	—	—	17.8	22.9	19.6	21.5	50.0	64.2	—	59.2	64.2	43.6	58.1
1150		621		—	—	—	—	—	10.7	21.4	14.1	15.5	40.3	56.9	—	49.0	56.9	35.5	51.0
	1157		625	—	—	—	—	—	10.2	20.0	13.5	14.8	39.2	54.9	—	47.4	53.2	34.3	49.9
1200		649		—	—	—	—	—	7.2	11.4	9.3	10.7	32.1	42.7	—	37.6	35.5	26.9	42.7
	1202		650	—	—	—	—	—	—	—	—	—	31.7	42.5	—	37.2	35.1	26.6	42.4
	1247		675	—	—	—	—	—	—	—	—	—	23.3	37.9	—	29.5	26.1	21.1	34.0
1250		677		—	—	—	—	—	—	—	—	—	22.8	37.6	—	29.0	25.5	20.7	33.4
	1292		700	—	—	—	—	—	—	—	—	—	17.8	29.8	—	23.2	20.3	16.9	26.2
1300		704		—	—	—	—	—	—	—	—	—	16.9	28.3	—	22.1	19.3	16.2	24.8
	1337		725	—	—	—	—	—	—	—	—	—	13.8	23.2	—	18.2	15.5	13.1	18.4
1350		732		—	—	—	—	—	—	—	—	—	12.8	21.4	—	16.9	14.1	12.1	16.2
	1382		750	—	—	—	—	—	—	—	—	—	11.0	17.6	—	14.2	11.9	10.3	13.1
1400		760		—	—	—	—	—	—	—	—	—	10.0	15.5	—	12.8	10.7	9.3	11.4
	1427		775	—	—	—	—	—	—	—	—	—	8.5	13.7	—	11.3	9.6	7.8	9.5
1450		788		—	—	—	—	—	—	—	—	—	7.2	12.1	—	10.0	8.6	6.6	7.9
	1472		800	—	—	—	—	—	—	—	—	—	6.2	10.5	—	9.1	8.0	5.8	6.6
1500		816		—	—	—	—	—	—	—	—	—	4.8	8.6	—	7.9	7.2	4.8	4.8

*1 bar = 10^5 N/m² = 10^5 Pa.

NOTE 1. For limitations of temperature for individual materials see notes to table 3.

NOTE 2. Pressures and temperatures shown in bold type are conversions from ratings given in ANSI B16.5-1981; intermediate values shown in lighter type have been obtained by linear interpolation. For other intermediate values it is recommended that they are obtained by linear interpolation using the original ANSI B16.5 figures shown in bold type.

NOTE 3. Temperature conversions from degrees fahrenheit to degrees celsius have been rounded to the nearest whole degree; pressure conversions from lbf/in² to bar have used a conversion factor from BS 350 : Part 1 of 1 lbf/in² = 0.0689476 bar and have been rounded to the nearest 0.1 bar.

Table 20. Class 1500: pressure/temperature ratings																			
Temperature				Material groups															
°F		°C		1.1	1.2	1.3	1.4	1.5	1.9	1.10	1.13	1.14	2.1	2.2	2.3	2.4	2.5	2.6	2.7
				Maximum permissible working pressure															
Up to		Up to		bar*	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar
100	122	38	50	255.5	258.6	239.2	212.7	239.2	258.6	258.6	258.6	258.6	248.2	248.2	248.2	248.2	248.2	231.7	231.7
200	212	93	100	250.4	258.6	236.4	208.5	238.1	255.7	256.0	258.6	258.6	239.1	240.6	199.7	239.9	241.8	226.6	226.6
300	302	149	150	232.7	258.6	226.1	193.7	234.1	245.5	246.8	258.6	258.6	206.8	213.4	174.4	210.3	219.3	208.6	208.6
392	392	200	200	231.9	257.6	225.4	193.1	233.0	243.8	245.2	257.6	257.6	203.9	210.9	172.3	204.6	217.3	207.1	207.1
400	482	204	250	226.1	251.0	219.9	188.6	224.8	232.0	233.4	251.0	251.0	182.0	192.7	156.5	187.9	202.7	196.2	196.2
500	572	260	300	226.0	250.8	219.8	188.4	224.7	231.9	233.2	250.8	250.8	181.6	192.4	156.2	187.2	202.5	195.9	195.9
600	662	316	350	219.2	244.0	213.3	182.9	221.0	227.3	224.2	244.0	244.0	163.6	178.4	143.5	171.7	191.9	184.7	184.7
650	707	343	375	218.6	243.4	212.7	182.4	220.6	226.8	223.4	243.4	243.4	162.0	177.2	142.4	170.3	191.0	183.7	183.7
700	797	371	400	208.7	231.8	202.8	173.6	215.3	222.3	221.1	231.8	231.8	152.7	167.0	133.6	160.1	180.8	175.5	175.5
750	842	399	425	206.5	229.3	200.6	171.7	214.1	221.3	220.6	229.3	229.3	150.7	164.8	131.7	157.9	178.6	173.7	173.7
800	887	427	450	193.6	214.4	188.5	161.5	210.1	212.1	211.9	214.4	214.4	145.2	158.1	126.2	152.7	172.1	167.3	167.3
850	932	454	475	188.6	208.6	183.7	157.5	208.6	208.6	208.6	208.6	208.6	143.1	155.5	124.1	150.7	169.6	164.8	164.8
900	977	482	500	185.1	202.7	180.3	154.8	202.7	202.7	202.7	202.7	202.7	140.7	153.1	120.7	147.2	165.5	160.6	160.6
950	1022	510	525	184.8	201.1	179.9	154.8	201.1	201.1	201.1	201.1	201.1	140.2	152.1	120.1	146.6	164.5	159.8	159.8
1000	1067	538	550	183.7	195.8	178.6	154.8	195.8	195.8	195.8	195.8	195.8	138.9	148.9	118.2	144.8	161.3	157.2	157.2
1050	1112	566	575	182.3	192.7	176.4	154.4	194.1	194.1	194.1	194.1	194.1	138.7	148.4	117.9	144.5	161.0	156.7	156.7
1100	1157	593	600	173.7	173.7	163.1	152.4	183.4	183.4	183.4	183.4	183.4	137.2	145.4	115.8	143.1	159.0	153.8	153.8
1150	1202	621	625	172.5	172.5	161.9	151.4	183.1	183.1	183.1	182.9	183.1	137.2	145.4	115.7	143.0	158.9	153.6	153.6
1200	1247	649	650	143.9	143.9	136.5	129.0	175.6	175.6	175.6	172.1	175.6	135.9	143.2	113.6	142.4	157.3	149.9	149.9
1250	1292	677	675	142.0	142.0	134.8	127.6	175.1	175.1	175.1	171.3	175.1	135.8	143.1	113.4	142.4	157.2	149.6	149.6
1300	1337	704	700	100.3	100.3	99.2	98.0	169.0	169.0	169.0	154.5	169.0	134.4	140.5	111.4	140.9	153.7	147.0	147.0
1350	1382	732	750	92.4	92.4	92.4	92.4	167.9	167.9	167.9	151.3	167.9	134.1	140.0	111.0	140.7	153.1	146.5	146.5
1400	1427	760	775	67.9	67.9	67.9	67.9	158.2	158.2	158.2	129.4	158.2	132.8	136.9	—	140.1	150.0	144.0	144.0
1450	1472	788	800	59.3	59.3	59.3	59.3	154.8	154.8	154.8	121.7	154.8	132.4	135.8	—	140.0	148.9	143.1	143.1
1500		816		44.1	44.1	44.1	44.1	117.7	138.9	138.9	101.4	137.4	130.2	134.1	—	135.6	138.8	136.7	136.7
				35.5	35.5	35.5	35.5	96.9	130.0	130.0	90.0	127.6	128.9	133.1	—	133.1	133.1	133.1	133.1
				26.0	26.0	26.0	26.0	75.3	101.3	109.7	77.1	113.0	119.3	129.0	—	127.7	129.0	123.8	126.4
				17.9	17.9	17.9	17.9	56.9	76.9	92.4	66.2	100.7	111.0	125.5	—	123.1	125.5	115.8	120.7
				—	—	—	—	—	63.8	81.9	58.5	85.0	109.0	124.9	—	121.4	124.9	109.2	118.1
				—	—	—	—	—	47.2	68.6	48.6	65.2	106.5	124.1	—	119.3	124.1	100.7	114.8
				—	—	—	—	—	42.4	58.5	44.2	56.2	100.4	119.7	—	114.1	119.7	92.6	110.0
				—	—	—	—	—	33.1	39.0	35.5	39.0	88.6	111.0	—	104.1	111.0	76.9	100.7
				—	—	—	—	—	29.5	38.1	32.7	35.9	83.6	107.0	—	98.7	107.0	72.7	96.9
				—	—	—	—	—	17.9	35.5	23.8	26.2	67.6	94.5	—	81.7	94.5	59.3	85.2
				—	—	—	—	—	17.1	33.2	22.6	25.0	65.5	91.2	—	79.0	89.5	57.3	83.2
				—	—	—	—	—	11.7	19.0	15.5	17.9	53.1	71.0	—	62.7	59.0	44.8	71.0
				—	—	—	—	—	—	—	—	—	52.5	70.7	—	62.2	58.3	44.4	70.4
				—	—	—	—	—	—	—	—	—	38.8	63.2	—	49.5	43.4	34.8	56.4
				—	—	—	—	—	—	—	—	—	37.9	62.7	—	48.6	42.4	34.1	55.5
				—	—	—	—	—	—	—	—	—	29.8	49.7	—	38.5	33.7	28.3	43.6
				—	—	—	—	—	—	—	—	—	28.3	47.2	—	36.5	32.1	27.2	41.4
				—	—	—	—	—	—	—	—	—	23.2	38.6	—	30.4	25.9	21.9	30.9
				—	—	—	—	—	—	—	—	—	21.4	35.5	—	28.3	23.8	20.0	27.2
				—	—	—	—	—	—	—	—	—	18.3	29.6	—	23.9	19.8	17.1	21.9
				—	—	—	—	—	—	—	—	—	16.5	26.2	—	21.4	17.6	15.5	19.0
				—	—	—	—	—	—	—	—	—	13.9	22.8	—	18.8	15.7	12.9	15.8
				—	—	—	—	—	—	—	—	—	11.7	20.0	—	16.5	14.1	10.7	13.1
				—	—	—	—	—	—	—	—	—	10.2	17.4	—	15.0	13.1	9.6	11.0
				—	—	—	—	—	—	—	—	—	8.3	14.1	—	13.1	11.7	8.3	8.3

*1 bar = 10⁵ N/m² = 10⁵ Pa.

NOTE 1. For limitations of temperature for individual materials see notes to table 3.

NOTE 2. Pressures and temperatures shown in bold type are conversions from ratings given in ANSI B16.5-1981; intermediate values shown in lighter type have been obtained by linear interpolation. For other intermediate values it is recommended that they are obtained by linear interpolation using the original ANSI B16.5 figures shown in bold type.

NOTE 3. Temperature conversions from degrees fahrenheit to degrees celsius have been rounded to the nearest whole degree; pressure conversions from lbf/in² to bar have used a conversion factor from BS 350 : Part 1 of 1 lbf/in² = 0.0689476 bar and have been rounded to the nearest 0.1 bar.

Table 21. Class 2500: pressure/temperature ratings

Temperature				Material groups															
°F		°C		1.1	1.2	1.3	1.4	1.5	1.9	1.10	1.13	1.14	2.1	2.2	2.3	2.4	2.5	2.6	2.7
Maximum permissible working pressure																			
Up to		Up to		bar*	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar
100		38		425.4	430.9	398.9	354.7	398.9	430.9	430.9	430.9	430.9	413.7	413.7	344.7	413.7	413.7	386.1	386.1
	122		50	417.1	430.9	394.1	347.7	397.0	426.1	426.6	430.9	430.9	398.5	400.9	332.9	403.0	403.1	377.6	377.6
200		93		387.8	430.9	377.1	322.7	390.2	408.9	411.3	430.9	430.9	344.7	355.8	291.0	350.3	365.4	347.5	347.5
	212		100	386.5	429.4	375.9	321.7	388.4	406.2	408.6	429.4	429.4	339.8	351.6	287.3	345.8	362.1	345.0	345.0
300		149		377.1	418.5	366.5	314.4	374.7	386.5	388.9	418.5	418.5	303.4	321.3	260.6	313.0	337.8	326.8	326.8
	302		150	376.9	418.2	366.2	314.2	374.6	386.3	388.5	418.2	418.2	302.7	320.8	260.2	312.4	337.5	326.4	326.4
	352		200	365.1	406.5	355.7	304.6	368.1	378.8	373.6	406.5	406.5	272.9	297.2	239.1	286.4	320.1	307.8	307.8
400		204		364.0	405.4	354.7	303.7	367.5	378.2	372.3	405.4	405.4	270.3	295.1	237.2	284.1	318.5	306.1	306.1
	482		250	347.6	386.2	338.1	289.3	359.0	370.5	368.4	386.2	386.2	254.4	278.1	222.5	267.1	301.6	292.6	292.6
500		260		344.0	382.0	334.4	286.1	357.1	368.9	367.5	382.0	382.0	251.0	274.4	219.3	263.4	297.9	289.6	289.6
	572		300	322.7	357.1	314.0	269.0	350.2	353.5	353.1	357.1	357.1	242.0	263.5	210.3	254.4	286.9	278.7	278.7
600		316		314.4	347.5	306.1	262.3	347.5	347.5	347.5	347.5	347.5	238.6	259.2	206.8	251.0	282.7	274.4	274.4
650		343		308.5	338.2	300.3	257.9	338.2	338.2	338.2	338.2	338.2	234.4	255.1	201.3	245.5	275.8	267.5	267.5
	662		350	308.0	335.3	299.7	257.9	335.3	335.3	335.3	335.3	335.3	233.8	253.5	200.3	244.5	274.1	266.2	266.2
700		371		306.1	326.1	297.9	257.9	326.1	326.1	326.1	326.1	326.1	231.7	248.2	197.2	241.3	268.9	262.0	262.0
	707		375	303.8	321.0	294.2	257.3	323.2	323.2	323.2	323.2	323.2	231.3	247.4	196.6	240.9	268.3	261.2	261.2
750		399		289.6	289.6	272.0	254.1	305.4	305.4	305.4	305.4	305.4	228.9	242.7	193.1	238.6	264.8	256.6	256.6
	752		400	287.5	287.5	270.1	252.4	318.7	318.7	318.7	304.7	318.7	228.8	242.5	192.9	238.5	264.6	256.2	256.2
	797		425	239.7	239.7	227.6	215.2	292.5	292.5	292.5	287.0	292.5	226.3	238.8	189.2	237.3	262.2	250.0	250.0
800		427		236.5	236.5	224.8	212.7	291.6	291.6	291.6	285.8	291.6	226.1	238.6	188.9	237.2	262.0	249.6	249.6
	842		450	167.0	167.0	165.1	163.2	281.8	281.8	281.8	257.7	281.8	223.8	233.9	185.4	234.9	256.2	245.0	245.0
850		454		153.8	153.8	153.8	153.8	279.9	279.9	279.9	252.3	279.9	223.4	233.0	184.8	234.4	255.1	244.1	244.1
	887		475	112.9	112.9	112.9	112.9	263.9	263.9	263.9	215.9	263.9	221.3	227.9	—	233.4	250.0	240.0	240.0
900		482		98.6	98.6	98.6	98.6	258.2	258.2	258.2	203.1	258.2	220.6	226.1	—	233.0	248.2	238.6	238.6
	932		500	73.4	73.4	73.4	73.4	196.4	231.7	231.7	168.9	229.1	217.1	223.5	—	226.0	231.4	228.0	228.0
950		510		59.3	59.3	59.3	59.3	161.7	216.8	216.8	149.6	212.7	215.1	222.0	—	222.0	222.0	222.0	222.0
	977		525	43.3	43.3	43.3	43.3	125.4	169.0	182.8	128.4	188.3	198.9	214.9	—	212.7	214.9	206.4	210.7
1000		538		29.6	29.6	29.6	29.6	94.5	128.2	153.8	110.3	167.5	185.1	208.9	—	204.8	208.9	193.1	201.0
	1022		550	—	—	—	—	—	106.6	136.5	97.3	141.5	181.6	208.0	—	202.2	208.0	181.8	196.6
1050		566		—	—	—	—	—	78.9	114.5	80.7	108.2	177.2	206.8	—	198.9	206.8	167.5	191.0
	1067		575	—	—	—	—	—	70.9	97.7	73.4	93.6	167.2	199.5	—	190.2	199.5	154.2	183.0
1100		593		—	—	—	—	—	55.2	65.2	59.3	65.2	147.9	185.1	—	173.4	185.1	128.2	167.5
	1112		600	—	—	—	—	—	49.0	63.7	54.5	59.9	139.4	178.5	—	164.4	178.5	121.1	161.4
1150		621		—	—	—	—	—	29.6	59.3	39.3	43.4	112.4	157.5	—	135.8	157.5	98.6	142.0
	1157		625	—	—	—	—	—	28.2	55.4	37.4	41.5	109.1	152.0	—	131.4	149.3	95.3	138.7
1200		649		—	—	—	—	—	19.7	31.7	25.5	29.6	88.6	118.2	—	104.5	98.6	74.8	118.2
	1202		650	—	—	—	—	—	—	—	—	—	87.6	117.7	—	103.5	97.5	74.1	117.2
	1247		675	—	—	—	—	—	—	—	—	—	64.6	105.3	—	82.1	72.7	58.3	94.3
1250		677		—	—	—	—	—	—	—	—	—	63.1	104.5	—	80.7	71.0	57.2	92.7
	1292		700	—	—	—	—	—	—	—	—	—	49.8	83.0	—	64.2	56.0	47.4	72.8
1300		704		—	—	—	—	—	—	—	—	—	47.2	78.9	—	61.0	53.1	45.5	68.9
	1337		725	—	—	—	—	—	—	—	—	—	38.6	64.4	—	50.8	42.9	36.6	51.6
1350		732		—	—	—	—	—	—	—	—	—	35.5	59.3	—	47.2	39.3	33.4	45.5
	1382		750	—	—	—	—	—	—	—	—	—	30.4	49.1	—	39.7	33.1	28.4	36.7
1400		760		—	—	—	—	—	—	—	—	—	27.6	43.4	—	35.5	29.6	25.5	31.7
	1427		775	—	—	—	—	—	—	—	—	—	23.3	38.0	—	31.2	26.5	21.4	26.3
1450		788		—	—	—	—	—	—	—	—	—	19.7	33.4	—	27.6	23.8	17.9	21.7
	1472		800	—	—	—	—	—	—	—	—	—	17.1	29.2	—	25.0	22.0	16.1	18.2
1500		816		—	—	—	—	—	—	—	—	—	13.8	23.8	—	21.7	19.7	13.8	13.8

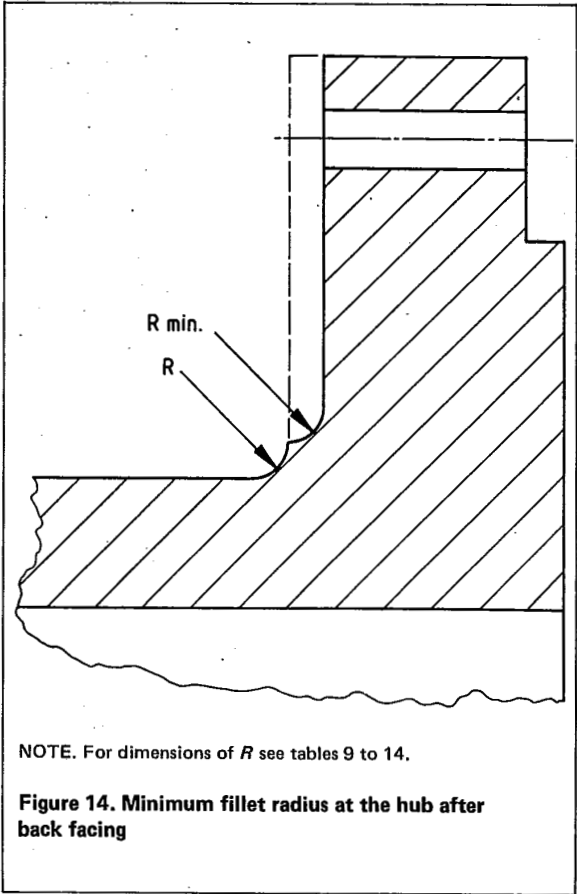
*1 bar = 10⁵ N/m² = 10⁵ Pa.

NOTE 1. For limitations of temperature for individual materials see notes to table 3.

NOTE 2. Pressures and temperatures shown in bold type are conversions from ratings given in ANSI B16.5-1981; intermediate values shown in lighter type have been obtained by linear interpolation. For other intermediate values it is recommended that they are obtained by linear interpolation using the original ANSI B16.5 figures shown in bold type.

NOTE 3. Temperature conversions from degrees fahrenheit to degrees celsius have been rounded to the nearest whole degree; pressure conversions from lbf/in² to bar have used a conversion factor from BS 350 : Part 1 of 1 lbf/in² = 0.0689476 bar and have been rounded to the nearest 0.1 bar.

Table 22. Minimum fillet radius at the hub after back facing	
Flange size	R_{min}
	mm
Up to and including DN 50	2
Over DN 50 and up to and including DN 200	3
Over DN 200	5



Appendices

Appendix A. Information to be supplied by the purchaser

The following information should be supplied by the purchaser when making an enquiry or placing an order for flanges complying with this Section of BS 1560.

- (a) Number and Section of this British Standard.
- (b) Flange type, by description or code number (see clause 1 and figures 1 and 2).
- (c) Type of facing, by description or letter (see clause 1).
- (d) Size in inches (see clause 2).
- (e) Class designation (see 3.1).
- (f) Material (see clause 4 and table 3) minimum strength requirements, if appropriate (see note 1 to table 3) and Charpy impact test requirements, if appropriate (see note 4 to table 3). Whether a certificate is required for the flange material (see 4.1).
- (g) Internal thread designation (see 7.3).
- (h) Weld end preparation required (see 7.4).
- (i) Any requirements for special finishes required (see 8.5.1).
- (j) External diameter and thickness of pipe where necessary (see 7.4).
- (k) Bore of weld-neck and socket-weld flanges (see tables 9, 10, 11, 12, 13 and 14).
- (l) Specific requirements for heat treatment condition (see 4.2.1).
- (m) Whether raised or flat faced flanges are required (see 8.2).
- (n) Whether flange is required for low temperature service (see note 4 to table 3).

Appendix B. Application and installation

NOTE. The information in this appendix is advisory only and it is not intended to be exhaustive.

B.1 The satisfactory operation of flanged joints depends upon the use of gaskets of appropriate materials and dimensions. The purchaser should consult with the gasket manufacturer.

B.2 Application at all temperatures should take into consideration the risk of leakage due to forces and moments developed in the connecting pipe, fitting, valve or other component.

B.3 At temperatures in the creep range, gradual relaxation of flanged joints may progressively reduce bolt loads and the tightness of the gaskets.

B.4 At low temperatures some of the materials specified undergo a sufficient decrease in impact resistance that they cannot safely sustain sudden changes of stress or temperature (see note 3 to table 3).

B.5 When a type B raised face is removed from a steel flange which is to be bolted to cast iron or copper alloy flanges, the thickness of such a steel flange is equal to the thickness specified in the appropriate table or, if a 1.6 mm raised face has to be removed to obtain the flat face, it is equal to the thickness specified less 1.6 mm. Where a 1.6 mm raised face has to be removed to obtain a flat face, the length through the hub will no longer comply with this Section of BS 1560 and on Class 150 and Class 300 flanges the flange thickness will no longer comply with this Section of BS 1560.

B.6 Limitations may be placed on threaded flanges due to the nature of any thread sealant used. Also it may be advantageous for an extra length of thread to be specified on the pipe to ensure that the pipe end comes close to the face of the flange.

B.7 Flanges may be required to be pressure tested after attachment of a pipe or other equipment or when forming an integral part of such equipment. The test pressure is then dependent on the requirements of the appropriate standard or code of practice in accordance with which the equipment has been fabricated or manufactured. Any test pressure should not exceed 1.5 times the allowable pressure at 20 °C rounded off to the next higher 1 bar increment.

Appendix C. Determination of bolt lengths for lapped-type joints

C.1 Determination of studbolt lengths for lapped-type joints or other than ring-joint type, all Classes

To determine the lengths of studbolts required for various types of lapped joint, the additions given in table 23 should be made to the appropriate basic dimensions given in appendix D.

C.2 Determination of studbolt lengths for lapped-type joints of the ring-joint type

C.2.1 *Classes 150 and 300.* Add the thickness t , in figure 6, of each lap included in the joints to the appropriate studbolt dimensions obtained from table 23.

C.2.2 *Classes 600 and upwards.* Add the thickness t , in figure 6, of each lap included in the joints to the appropriate studbolt dimensions obtained from table 23.

C.3 Determination of headed bolt lengths for all types and Classes of lapped-type joint

The length of a headed bolt for any of the facing combinations in C.1 and C.2, is equal to the length of the appropriate studbolt plus 3.2 mm minus the nominal bolt size.

Table 23. Determination of studbolt lengths for lapped-type joints	
Type of lapped joint	Addition to basic dimension
Lapped raised face to lapped raised face	Add thickness t , in figure 6, of both laps
Lapped spigot to lapped recess	Add thickness t , in figure 6, of spigot lap or 6.4 mm, whichever is the greater, plus thickness t , in figure 4, of recess lap
Lapped tongue to lapped groove	Add thickness t , in figure 6, of tongue lap plus thickness t , in figure 4, of groove lap plus 6.4 mm
Lapped raised face to 1.6 mm raised face of flange (Classes 150 and 300)	Add thickness t , in figure 6, of one lap
Lapped raised face to 6.4 mm on flange (all Classes)	Add thickness t , in figure 6, of one lap plus 6.4 mm
Lapped spigot to recess on flange	Add thickness t , in figure 6, of spigot lap or 6.4 mm whichever is the greater
Lapped recess to spigot on flange	Add thickness t , in figure 6, of recess lap plus 6.4 mm
Lapped tongue to groove on flange	Add thickness t , in figure 6, of tongue lap plus 6.4 mm
Lapped groove to tongue on flange	Add thickness t , in figure 6, of groove lap plus 6.4 mm

Appendix D. Recommended bolt lengths for flanges other than lapped-type

Bolt lengths for flanges other than lapped-type are given in table 24.



Figure 15. Bolting for flanges, Class 150 to Class 2500 (see table 24)

Table 24. Bolting for flanges, Class 150 to Class 2500 (see figure 15)																											
Nominal size		Class 150				Class 300				Class 600				Class 900				Class 1500				Class 2500					
		Length studbolts L ₁ (see note 3)			Length headed bolts L ₂ (see note 2)	Length studbolts L ₁ (see note 3)			Length headed bolts L ₂ (see note 2)	Length studbolts L ₁ (see note 3)			Length headed bolts L ₂ (see note 2)	Length studbolts L ₁ (see note 3)			Length headed bolts L ₂ (see note 2)	Length studbolts L ₁ (see note 3)			Length headed bolts L ₂ (see note 2)	Length studbolts L ₁ (see note 3)			Length headed bolts L ₂ (see note 2)		
		1.6 mm raised face	Ring-joint	Lapped joints (basic dimensions only) (see note 2)	1.6 mm raised face	1.6 mm raised face	Ring-joint	Lapped joints (basic dimensions only) (see note 2)	1.6 mm raised face	6.4 mm raised face	Ring-joint	Spigot and recess also tongue and groove	Lapped joints (basic dimensions only) (see note 2)	6.4 mm raised face	Ring-joint	Spigot and recess also tongue and groove	Lapped joints (basic dimensions only) (see note 2)	6.4 mm raised face	Ring-joint	Spigot and recess also tongue and groove	Lapped joints (basic dimensions only) (see note 2)	6.4 mm raised face	Ring-joint	Spigot and recess also tongue and groove	Lapped joints (basic dimensions only) (see note 2)		
in	DN	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in			
1/2	15	2 1/4	—	2 1/4	2	2 1/2	3	2 1/2	2 1/4	3	3	2 3/4	2 1/2	For these sizes Class 1500 dimensions are used				4 1/4	4 1/4	4	3 3/4	4 1/4	4 3/4	4 1/2	3 3/4		
3/4	20	2 1/2	—	2 1/2	2	3	3 1/2	3	2 1/2	3 1/2	3 1/2	3 1/4	3					4 1/2	4 1/2	4 1/4	4	5	5	4 3/4	4 1/2	4 3/4	4 1/2
1	25	2 1/2	3	2 1/2	2 1/4	3	3 1/2	3	2 1/2	3 1/2	3 1/2	3 1/4	3					5	5	4 3/4	4 1/2	5 1/2	5 1/2	5 1/4	5	5 1/4	5
*1 1/4	32	2 3/4	3 1/4	2 3/4	2 1/4	3 1/4	3 3/4	3 1/4	2 3/4	3 3/4	3 3/4	3 1/2	3 1/4					5	5	4 3/4	4 1/2	6	6	5 3/4	5 1/2	6 1/4	6 1/4
1 1/2	40	2 3/4	3 1/4	2 3/4	2 1/2	3 1/2	4	3 1/2	3	4 1/4	4 1/4	4	3 3/4					5 1/2	5 1/2	5 1/4	5	6 3/4	6 3/4	6 1/2	6 1/4	6 1/4	6 1/4
2	50	3 1/4	3 3/4	3 1/4	2 3/4	3 1/2	4	3 1/2	3	4 1/4	4 1/4	4	3 3/4	For these sizes Class 1500 dimensions are used				5 3/4	5 3/4	5 1/2	5 1/4	7	7	6 3/4	6 1/2		
*2 1/2	65	3 1/2	4	3 1/2	3	4	4 1/2	4	3 1/4	4 3/4	4 3/4	4 1/2	4 1/4					6 1/4	6 1/4	6	5 3/4	7 3/4	8	7 1/2	7 1/4		
3	80	3 1/2	4	3 1/2	3	4 1/4	4 3/4	4 1/4	3 1/2	5	5	4 3/4	4 1/2					7	7	6 3/4	6 1/2	8 3/4	9	8 1/2	8 1/4		
4	100	3 1/2	4	3 1/2	3	4 1/2	5	4 1/2	3 3/4	5 3/4	5 3/4	5 1/2	5 1/4					7 3/4	7 3/4	7 1/2	7 1/4	10	10 1/4	9 3/4	9 1/2		
*5	125	3 3/4	4 1/4	3 3/4	3 1/4	4 3/4	5 1/4	4 3/4	4 1/4	6 1/2	6 1/2	6 1/4	6	For these sizes Class 1500 dimensions are used				9 3/4	9 3/4	9 1/2	9 1/4	11 3/4	12 1/4	11 1/2	11 1/4		
6	150	4	4 1/2	4	3 1/4	4 3/4	5 1/2	4 3/4	4 1/4	6 3/4	6 3/4	6 1/2	6 1/4					10 1/4	10 1/4	10	9 3/4	13 1/2	14	13 1/4	13		
8	200	4 1/4	4 3/4	4 1/4	3 1/2	5 1/2	6	5 1/2	4 3/4	7 1/2	7 3/4	7 1/4	7					11 1/2	12 3/4	11 1/4	11	15	15 1/2	14 3/4	14 1/2		
10	250	4 1/2	5	4 1/2	4	6 1/4	6 3/4	6 1/4	5 1/2	8 1/2	8 1/2	8 1/4	8					13 1/4	13 1/2	13	12 3/4	19 1/4	20	19	18 3/4		
12	300	4 3/4	5 1/4	4 3/4	4	6 3/4	7 1/4	6 3/4	5 3/4	8 3/4	8 3/4	8 1/2	8 1/4	For these sizes Class 1500 dimensions are used				14 3/4	15 1/4	14 1/2	14 1/4	21 1/4	22	21	20 3/4		
14	350	5 1/4	5 3/4	5 1/4	4 1/2	7	7 1/2	7	6 1/4	9 1/4	9 1/4	9	8 3/4					16	16 3/4	15 3/4	15 1/2	—	—	—	—		
16	400	5 1/4	5 3/4	5 1/4	4 1/2	7 1/2	8	7 1/2	6 1/2	10	10	9 3/4	9 1/2					17 1/2	18 1/2	17 1/4	17	—	—	—	—		
18	450	5 3/4	6 1/4	5 3/4	5	7 3/4	8 1/4	7 3/4	6 3/4	10 3/4	10 3/4	10 1/2	10 1/4					19 1/2	20 3/4	19 1/4	19	—	—	—	—		
20	500	6 1/4	6 3/4	6 1/4	5 1/2	8	8 3/4	8	7 1/4	11 1/4	11 1/2	11	10 3/4	For these sizes Class 1500 dimensions are used				21 1/4	22 1/4	21	20 3/4	—	—	—	—		
24	600	6 3/4	7 1/4	6 3/4	6	9	10	9	8	13	13 1/4	12 3/4	12 1/2					24 1/4	25 1/2	24	23 3/4	—	—	—	—		

*The use of these sizes should be avoided in new constructions.

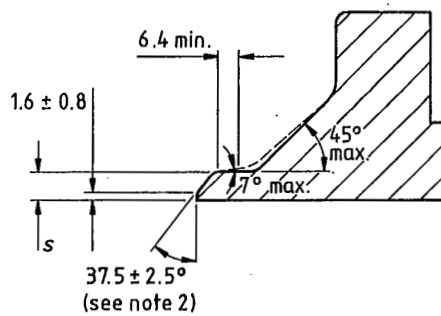
NOTE 1. This table should be read in conjunction with tables 9 to 14.

NOTE 2. For determination of studbolt and headed bolt lengths for lapped-type joints see appendix C.

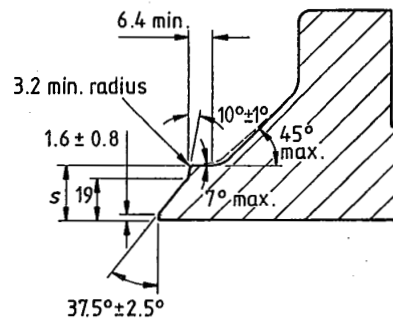
NOTE 3. The ends of all studbolts should be rounded or chamfered. Studbolt lengths do not include the heights of these ends.

Appendix E. Recommendations for weld ends of weld-neck flanges

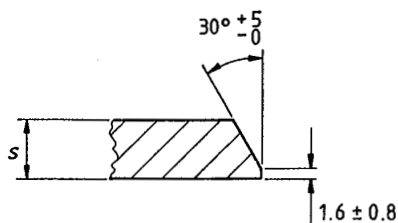
Recommendations for welding neck flange ends of wall thickness up to 22.2 mm (inclusive) and greater than 22.2 mm are given in figure 16.



(a) Bevel for wall thicknesses (s) up to and including 22.2 mm



(b) Bevel for wall thicknesses (s) greater than 22.2 mm



(c) Alternative bevel for wall thicknesses (s) up to and including 22.2 mm

Linear dimensions are in millimetres.

NOTE 1. For flanges required to connect with ferritic steel pipe of nominal wall thickness less than 4.8 mm the welding ends should be finished to a slight chamfer or be square, at the option of the manufacturer.

NOTE 2. For flanges required to connect to austenitic stainless steel pipe of nominal wall thickness 3.2 mm or less, the welding ends should be finished to a slight chamfer.

NOTE 3. For dimensions of weld-neck flanges see tables 9-14.

Figure 16. Recommended bevel angles for welding

Appendix F. Dimensions of seamless and welded steel pipes

Dimensions of seamless and welded steel pipes which are given in BS 1600 : Part 2 are reproduced in table 25 for information only.

Nominal pipe size	Outside diameter	Nominal wall thickness																
		Schedule 5S*	Schedule 10S*	Schedule 10	Schedule 20	Schedule 30	Schedule 40S*	Standard wall	Schedule 40	Schedule 60	Schedule 80S*	Extra strong	Schedule 80	Schedule 100	Schedule 120	Schedule 140	Schedule 160	Double extra strong
in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1/2	21.3	1.65	2.11	—	—	—	2.77	2.77	2.77	—	3.73	3.73	3.73	—	—	—	4.78	7.47†
3/4	26.7	1.65	2.11	—	—	—	2.87	2.87	2.87	—	3.91	3.91	3.91	—	—	—	5.56	7.82†
1	33.4	1.65	2.77	—	—	—	3.38	3.38	3.38	—	4.55	4.55	4.55	—	—	—	6.35	9.09†
1 1/4#	42.2	1.65	2.77	—	—	—	3.56	3.56	3.56	—	4.85	4.85	4.85	—	—	—	6.35	9.70†
1 1/2	48.3	1.65	2.77	—	—	—	3.68	3.68	3.68	—	5.08	5.08	5.08	—	—	—	7.14	10.16†
2	60.3	1.65	2.77	—	—	—	3.91	3.91	3.91	—	5.54	5.54	5.54	—	—	—	8.74	11.07†
2 1/2#	73.0	2.11	3.05	—	—	—	5.16	5.16	5.16	—	7.01	7.01	7.01	—	—	—	9.52	14.02†
3	88.9	2.11	3.05	—	—	—	5.49	5.49	5.49	—	7.62	7.62	7.62	—	—	—	11.13	15.24†
4	114.3	2.11	3.05	—	—	—	6.02	6.02	6.02	—	8.56	8.56	8.56	—	11.13	—	13.49	17.12†
5*	141.3	2.77	3.40	—	—	—	6.55	6.55	6.55	—	9.52	9.52	9.52	—	12.70	—	15.88	19.05†
6	168.3	2.77	3.40	—	—	—	7.11	7.11	7.11	—	10.97	10.97	10.97	—	14.27	—	18.26	21.95†
8	219.1	2.77	3.76	—	6.35	7.04	8.18	8.18	8.18	10.31	12.70	12.70	12.70	15.09	18.26	20.62	23.01	22.22†
10	273.0	3.40	4.19	—	6.35	7.80	9.27	9.27	9.27	12.70	12.70	12.70	12.70	15.09	18.26	21.44	25.40	25.40
12	323.9	3.96	4.57	—	6.35	8.38	9.52	9.52	10.31	14.27	12.70	12.70†	12.70†	17.47	21.44	25.40	28.58	33.34
14	355.6	3.96	4.78	6.35	7.92	9.52	—	9.52	11.13	15.09	—	12.70†	19.05	23.82	27.79	31.75	35.71	—
16	406.4	4.19	4.78	6.35	7.92	9.52	—	9.52	12.70	16.64	—	12.70	21.44	26.19	30.96	36.52	40.49	—
18	457.2	4.19	4.78	6.35	7.92	11.13	—	9.52†	14.27	19.05	—	12.70†	23.82	29.36	34.92	39.69	45.24	—
20	508.0	4.78	5.54	6.35	9.52	12.70	—	9.52	15.08	20.62	—	12.70	26.19	32.54	38.10	44.45	50.01	—
22	558.8	4.78	5.54	6.35	9.52	12.70	—	9.52	15.88	22.22	—	12.70	28.58	34.92	41.28	47.62	53.98	—
24	609.6	5.54	6.35	6.35	9.52	14.27	—	9.52	17.48	24.61	—	12.70†	30.96	38.89	46.02	52.39	59.54	—

*Schedules 5S, 10S, 40S and 80S apply to austenitic chromium-nickel steel pipe only.

†Except when marked †, Standard, Extra Strong and Double Extra Strong wall thicknesses have pipe of corresponding wall thickness listed under one of the schedule numbers.

* The use of these sizes should be avoided in new constructions.

NOTE 1. Dimensions in this table are based on ANSI/ASME B36.10 M and ANSI/ASME B36.19.

NOTE 2. For tolerances on outside diameter and wall thickness see appropriate specifications.

Appendix G. Use of metric bolting in lieu of inch bolting

G.1 General

If users prefer or require to use metric bolting in lieu of the inch bolting specified in this Section of BS 1560, **G.3** gives the comparable metric bolt sizes that have been agreed in ISO/TC 5/SC 10 in the preparation of ISO 7005.

G.2 Gaskets

Warning. Users should note that the centring of an inside bolt circle gasket in an assembled flange joint will be affected when using metric bolting. It should be noted that bolt hole clearances may be reduced or increased. Reduction of bolt hole clearances may prevent the use of inch dimensioned metal gaskets, and an increase in bolt hole clearances could mean that the gasket will protrude into the bore of the flange or that the sealing element of a spiral wound gasket will over-ride the raised face. It is essential that great care be taken to ensure that gaskets are centred properly; this applies particularly to the spiral wound gaskets which incorporate a centring ring where the user has to ensure the sealing element is correctly located on the flange face.

However, with care, and dependant on the tolerances which have been used it may be possible to fit the normal inch dimensioned gasket when using metric bolting in existing inch drilled holes.

G.3 Comparable sizes

If metric bolting is to be used the comparable inch and metric sizes are as given in table 26.

Table 26. Nominal bolt diameters

Inch	Metric
$\frac{1}{2}$	M14
$\frac{5}{8}$	M16
$\frac{3}{4}$	M20
$\frac{7}{8}$	M24
1	M27
$1\frac{1}{8}$	M30
$1\frac{1}{4}$	M33
$1\frac{3}{8}$	M36
$1\frac{1}{2}$	M39
$1\frac{5}{8}$	M42
$1\frac{3}{4}$	M45
$1\frac{7}{8}$	M48
2	M52
$2\frac{1}{4}$	M56
$2\frac{1}{2}$	M64
$2\frac{3}{4}$	M70
3	M76
$3\frac{1}{2}$	M90

G.4 Inch/metric bolt comparisons

To enable users to ascertain precisely the differences in the two systems, table 27 is given for reference.

Up to and including size M45, coarse series bolts complying with BS 3643 : Part 1 should be used. In sizes M48 and larger the equivalent metric studbolts should use the constant 4 mm pitch series in place of the imperial 8 threads per inch series.

Table 27. Inch/metric bolt comparisons						
Bolt diameter				Bolt hole diameter		Clearances
Inch bolting		Metric	Difference	Inch hole		Metric bolt in an inch hole
in	mm	mm	mm	in	mm	mm
1/2	12.70	M14	+1.30	5/8	15.88	1.88
5/8	15.88	M16	+0.12	3/4	19.05	3.05
3/4	19.05	M20	+0.95	7/8	22.23	2.23
7/8	22.23	M24	+1.77	1	25.40	1.40
1	25.40	M27	+1.60	1 1/8	28.58	1.58
1 1/8	28.58	M30	+1.42	1 1/4	31.75	1.75
1 1/4	31.75	M33	+1.25	1 3/8	34.93	1.93
1 3/8	34.93	M36	+1.07	1 1/2	38.10	2.10
1 1/2	38.10	M39	+0.90	1 5/8	41.28	2.28
1 5/8	41.28	M42	+0.72	1 3/4	44.45	2.45
1 3/4	44.45	M45	+0.55	1 7/8	47.63	2.63
1 7/8	47.63	M48	+0.37	2	50.80	2.80
2	50.80	M52	+1.20	2 1/8	53.98	1.98
2 1/4	57.15	M56	-1.15	2 3/8	60.33	3.33
2 1/2	63.50	M64	+0.50	2 5/8	66.68	2.68
2 3/4	69.85	M70	+0.15	2 7/8	73.03	3.03
3	76.20	M76	-0.20	3 1/8	79.38	3.38
3 1/2	88.90	M90	+0.10	3 5/8	92.08	2.08

Appendix H. Comparison of flange descriptions in BS 1560 : Part 2 : 1970 with descriptions used in this Section of BS 1560

Descriptions of flanges used in this Section of BS 1560 are compared with descriptions given in BS 1560 : Part 2 : 1970 in table 28.

Table 28. Steel flange descriptions and code numbers specified in BS 1560 : Section 3.1 : 1989 and BS 1560 : Part 2 : 1970		
Code number in BS 1560 : Section 3.1 : 1989	Description of flange	
	In BS 1560 : Section 3.1 : 1989	In BS 1560 : Part 2 : 1970
101	Plate flange for welding	—
105	Blank flange	Blank (blind) flange
111	Weld-neck flange	Welding-neck flange
112	Hubbed slip-on flange for welding	Slip-on welding flange
113	Hubbed threaded flange	Screwed flange
114	Hubbed socket weld flange	Socket-welded flange
115	Loose hubbed flange for lapped pipe end	Lapped flange
121	Integral flange	Integral flange

Publications referred to

BS 21	Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions)
BS 350	Conversion factors and tables
	Part 1 Basis of tables. Conversion factors
BS 1134	Method for the assessment of surface finish
	Part 1 Method and instrumentation
BS 1501	Steels for fired and unfired pressure vessels: plates
	Part 1 Specification for carbon and carbon manganese steels
	Part 2 Alloy steels: Imperial units
	Part 3 Corrosion and heat resisting steels. Imperial units
BS 1503	Specification for steel forgings (including semi-finished forged products) for pressure purposes
BS 1504	Specification for steel castings for pressure purposes
BS 1600	Specification for dimensions of steel pipe for the petroleum industry
BS 1640	Specification for steel butt-welding pipe fittings for the petroleum industry
BS 1768	Specification for unified precision hexagon bolts, screws and nuts (UNC and UNF threads). Normal series
BS 1769	Specification. Unified black hexagon bolts, screws and nuts (UNC and UNF threads). Heavy series
BS 2633	Specification for Class 1 arc welding of ferritic steel pipework for carrying fluids
BS 3351	Specification for piping systems for petroleum refineries and petrochemical plants
BS 3381*	Specification for metallic spiral-wound gaskets for use with flanges to BS 1560, Parts 1 and 2
BS 3410	Specification for metal washers for general engineering purposes
BS 3643	ISO metric screw threads
	Part 1 Principles and basic data
BS 4504	Circular flanges for pipes, valves and fittings (PN designated)
	Part 3 Specification for steel, cast iron and copper alloy flanges
BS 4570	Specification for fusion welding of steel castings
BS 4882	Specification for bolting for flanges and pressure containing purposes
BS 5135	Specification for arc welding of carbon and carbon manganese steels
BS 5500	Specification for unfired fusion welded pressure vessels
BS 6920	Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water
	Part 1 Specification
BS 7076	Dimensions of gaskets for flanges to BS 1560
	*Part 1 Specification for non-metallic flat gaskets
	*Part 2 Specification for metallic ring-joint gaskets for use with steel flanges
	*Part 3 Specification for non-metallic envelope gaskets
	*Part 4 Specification for corrugated, flat or grooved metallic and filled metallic gaskets for use with steel flanges
ANSI/ASME B1.20.1	Pipe threads, general purpose (inch)
ANSI B16.5	Pipe flanges and flanged fittings
ANSI B16.9	Factory-made wrought steel butt welding fittings
ANSI B31.3	Chemical plant and petroleum refinery piping
ANSI/ASME B36.10 M	Welded and seamless wrought steel pipe
ANSI/ASME B36.19 M	Stainless steel pipe
API Std. 5B	Threading, gauging and thread inspection of casing, tubing and line pipe threads
ASTM A105	Specification for forgings, carbon steel, for piping components
ASTM A182	Specification for forged or rolled alloy-steel pipe flanges, forged fittings, and valves and parts for high-temperature service
ASTM A203	Specification for pressure vessel plates, alloy steel, nickel
ASTM A204	Specification for pressure vessel plates, alloy steel, molybdenum
ASTM A216	Specification for carbon-steel castings suitable for fusion welding for high-temperature service
ASTM A217	Specification for martensitic stainless steel and alloy steel castings for pressure-containing parts suitable for high-temperature service
ASTM A240	Specification for heat resisting chromium and chromium-nickel stainless steel plate, sheet, and strip for pressure vessels
ASTM A350	Specification for forgings, carbon and low alloy steel, requiring notch toughness testing for piping components
ASTM A351	Specification for austenitic steel castings for high-temperature service
ASTM A362	Specification for ferritic and martensitic steel castings for pressure-containing parts suitable for low-temperature service
ASTM A387	Specification for pressure vessel plates, chromium-molybdenum alloy steel
ASTM A515	Specification for pressure vessel plates, carbon steel, for intermediate and higher-temperature service
ASTM A516	Specification for pressure vessel plates, carbon steel, for moderate and lower-temperature service
ASTM A537	Pressure vessel plates, heat-treated, carbon-manganese-silicon steel
ISO 7005	Metallic flanges
	Part 1 Steel flanges

Send your requirement

Send a drawing, product list, size, material grade, standard, schedule or wall thickness, testing and project document requirements.

EMAILinfo@lkiping.com**WHATSAPP**[+86 139 0327 9556](https://wa.me/8613903279556)**TECHNICAL RESOURCES**www.lkiping.com/technical/**RESPONSE AND DOCUMENT COORDINATION**

Initial enquiries are answered within 24 hours, including weekends, by email or WhatsApp. Drawing review, material/standard matching and project document requirements can be discussed and organized with the buyer. Third-party inspection can be buyer-nominated or coordinated on request.

ADDRESS

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